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VOLTITE

The Wonderful Discovery of Coating Metals with Gold, Silver, Nickel, Copper, Tin and Brass by Frictional Precipitation.

By Charles H. Proctor.

The industry of electroplating of metals has become so vast in its proportions in connection with electrometallurgy that on every hand in our social and commercial life we behold the transmutation of one metal to another for personal adornment, in connection with art, household utilities and the thousand and one purposes for commercial use. Metals are deposited upon metals for protection (a more positive metal will protect a less positive one), for instance, the deposit of the metal zinc upon iron or steel, or the deposit of a negative metal upon a more positive metal will give protection when such metals are thoroughly understood in their ratio.

One of the great problems that has offered itself, for years, for solution is the replacement of electro-deposited metals lost by friction when in constant use. Of course such metals can be renewed, but to accomplish this every house would have to be provided with an electroplating plant, which of course is impossible. Patents have been granted galore in an effort to overcome this important problem, only to prove worthless in their application for commercial use. Such substances when applied to the metal to be renovated would only give an infinitesimal film that could almost be removed with a stroke of the hand. Recently such a patent was granted in England and the United States for the deposition of nickel and other metals by friction. The subject proved interesting and created considerable discussion in the electro-metallurgical world, but from a number of experiments made to prove its utility as a method of replacement for iron or exposed surfaces coated with the regular method of electro-deposition, its value was found to be nil—a dream. The energy used in this application was so great in proportion to the results obtained that the process was more of a theoretical than a practical demonstration of its commercial utility.

The solution of this important problem was reserved for Arthur T. Firth of Auckland, New Zealand, internationally known for his research work as a chemist and metallurgist, whose special studies have been the electrical precipitation of metals and the origin of the deposition of metals in their natural state, together with the treatment of the refractory gold and silver ores. Mr. Firth, realizing the great possibilities of frictional precipitation of metals and the results of untold value that could accrue from a successful application of a metal to a metallic surface, made a special study of the problem. After three years of hard study, when the secret appeared to be solved, the inventor had the mortification of seeing all his grand theories go up in smoke when put to a practical test. Mr. Firth had, at this stage, solved the method of precipitation of gold, silver, copper, tin and nickel, but the waste accompanying the process was so great as to make the discovery practically worthless from a commercial standpoint.

At last, in December, 1909, success attended the persistent study. The result was Voltite, an instantaneous electroplating powder which could be produced in any of the above metals, and at such a price as would insure its commercial utility. The writer had the privilege of witnessing, and also making a number of experiments, through the courtesy of Messrs. Holmes C. Walton and F. A. Hood, of Wellington, New Zealand, at the Hotel Astor, during the week of May 8. These demonstrations proved beyond a doubt the commercial value of Voltite.

One of the most interesting, and, I might say, wonderful applications of Voltite, was that of silver direct upon steel without any preliminary effort, at an absolutely chemically clean surface, such as must be obtained in the regular method of electro-deposition. The articles used were steel knives, such as may be found in hotels. The silver deposit was uniform, dense, homogenous and adherent, and could be burnished after a few moments application of Voltite. This one experiment alone proved the practical utility of the method and removed every trace of skepticism from the mind of the writer. When we take into consideration the millions of steel knives in use in this country, it can readily be seen the demand that would be created for such a valuable article in every household to replate worn articles of such a like nature in everyday use. Again, when we consider the vast amount of metal articles that become worn from constant use by friction and never reach the electroplater for refinishing, the wonderful possibilities of the invention can readily be seen.

Hundreds of thousands of women in this country are always anxious to keep their table and silver-plated ware like new, but it is impossible for them to do so, because every time the articles are cleansed so much of the silver or other metal is removed by the friction of the polishing powder, causing each time a reduction of the thickness of the deposited metal. This is where the advantage of using Voltite comes in; instead of decreasing the thickness of the plate it increases it by continuous friction, so articles in daily use can always be made to look like new without the unsightly appearance that results from articles when the electro deposit becomes worn in spots. Many times such articles would be sent to the jobbing electroplater to be refinished, but it is only possible to find these in cities of considerable size, and then because they do not advertise it is sometimes difficult to locate them, again every home does not subscribe for a business directory. But Voltite will give to every home the advantage of refinishing their metal goods in gold, silver, nickel, copper,

tin and other metals, and the housewife can thank Mr. Firth for the years applied to the discovery of such a wonderful method of coating metals, so simple that a child of immature years can apply it.

Voltite, of course, can never take the place of the regular method of electro-deposition, because each article must be treated individualy, and it can therefore never take its place in regular manufacture. Those that understand the methods of electroplating can readily realize this. The possibilities of the application of Voltite are so many that in the event of its being placed upon the market in this country, I predict a tremendous demand for it. Dr. Graham Bell, the inventor of the telephone, when in New Zealand said: "I am greatly interested in Voltite. It is undoubtedly a wonderful and simple process. Articles that have been sent to the electroplater can now be treated by anyone on the spot. I have seen practical demonstrations with Voltite. Its practical possibilities are many. The action of Voltite is electrolytic the same as electroplating and much simplified."

THE ADHESION OF ELECTRO-DEPOSITED SILVER IN RELATION TO THE NATURE OF THE GERMAN SILVER BASIS METAL.*

By Andrew McWilliam, A.R.S.M., M.Met., and W. R. Barclay, A.M.I.E.E.†

(Concluded from April.)

(a) SAMPLES TESTED.

The experiments were made on a number of spoons and forks of various sizes supplied by manufacturers and of the grades known as Firsts, Seconds, Thirds and Fifths. The electro-plating solution used was the usual standard one of the double cyanide of silver and potassium, and the weight of silver deposited on each strip was at least equal to that given to the highest qualities of spoons and forks and to those previously described.

Table II gives the weight of deposit on the strips of each alloy, calculated per square inch of the surface:

Table II.

Marks.	Deposit per Sq. In. in Ounces Troy.
A	0.0196
B	0.016
C	0.0215
D	0.021
E	0.017
F	0.024
G	0.024
BZ	0.0198

The slight variation in the weight of deposit is explained by the fact that it was considered advisable to give each strip a minimum deposit at least of the quality indicated above, without in any way interrupting the course of deposition, such as by taking the specimens out of the vat for intermediate scratch-brushing, a practice often followed in the making of very heavy deposits, in order to keep the coating as smooth as possible. The strips were consequently in the vat during the greater part of the working day, and naturally the rate of deposition varied as more or less work passed through the vat in the course of the day's operations.

(b) TESTS APPLIED.

The guiding principle in designing tests for the purposes of the investigation was to subject the samples to strains such that the basis metal and its silver coating would be given, if possible, a certain amount of movement relative to one another, and in addition that the coating itself should be fractured. In all the cases of stripping of which mention has been made in the introduction, the stages of development of the fault have appeared to be, first, that along the edges of the spoons or forks concerned the silver deposit has in course of severe wear become broken or cut through, then these broken edges have gradually curled or peeled up (see Figs. 1 and 2, Plate I), and if the deposited silver is thick, and therefore of sufficient substance, it may readily be pulled away from the basis metal surfaces. In some cases it has been possible by care and patience to peel the silver coating away from a fork almost from end to end.

*Paper read at London meeting, Institute of Metals, January, 1911.
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Having the points cited in the first portion of this article in view, several preliminary tests were made with the apparatus available, and finally it was decided to adopt the test which had first appealed to the authors, namely, a simple cold bending test. One part of the sample is gripped in a vice, and the free part is bent to and fro until it breaks off. It is advisable that the angle of the bend should be about a right angle, in order to ensure that the deposit and the basis metal get sufficient movement relative to one another. It will be evident that this test is an extremely severe one, and that unless the metals are holding together almost as one, the silver must be parted from its base, for the silver on the outside of the bend must move a greater distance than the basis metal, and on the inside of the return bend a less distance. In view of the results it should be noted also that the order of increasing ductility of the metals being as a rule from the high percentage nickel alloys to the low ones, the latter bearing more bending before fracture than the former, the test is more severe for metals of the G, F, and E types than for A and B. In practically every case the samples were tested to destruction. Microscopical Examination.—In addition to the mechanical tests applied, representative sections were cut from each series for microscopical examination.

(c) RESULTS OF THE TESTS.

In the case of all the samples of the Third and Fifth grades and of the G, F, and E specimens of the special alloys in Table I, it has been exceedingly difficult to peel up the silver coating in any way. In some few cases just at the point of fracture it has been possible to raise the silver coating very slightly at the top, but in endeavoring to strip it further the silver, though very tenacious and ductile, has broken rather than leave its base. It has indeed repeatedly surprised the authors to find how extremely adherent the coating is even under the severest tests. Test-pieces of first and second grades and of A and B of Table I, however, behaved in a very different manner. In practically every instance the silver coating left the base at the point of fracture, and in a large majority of instances it could be pulled away quite readily from a considerable part of the surface without breaking the silver. In the cases of C and D evidence of imperfect adhesion was not so pronounced as in A and B, still the authors do not regard these as so good as E, F, and G.

In the earlier experiments described, a few samples of first and second grades were given rather a different treatment; they were prepared for plating in the ordinary manner, but before silver was deposited on them they were given a thin coating of copper from an alkaline copper solution, then transferred to the silver vat and given a heavy deposit of silver. These samples were then put through the same tests as the previous ones, and again there was obtained evidence of imperfect adhesion,

though not quite to the same extent as formerly. The adhesion even in these cases was not to be compared, however, with that obtained with the lower percentage nickel alloys G, F, and E. The electro-deposited silver in all the cases was tough and strong. In order to carry the matter still further, the authors quite recently obtained from another firm of German silver manufacturers a few spoons and forks of first and second grades, and the results given by these pieces when plated and tested are in every way confirmatory of the foregoing results.

A considerable number of test-pieces after plating and before being submitted to the bending tests were burnished by experienced silver finishers. This process is considered in the trade to be, in addition to a help in finishing, a reliable means of testing the adhesion of the silver. The operation is usually done by clamping the article firmly on a bench and then passing a smooth, dry steel burnishing tool over the entire surface and particularly on the edges. Unless the silver is in closest contact with its base at every point, the deposit will not pass this test without blistering. Every one of the test-pieces, spoons, forks, and blank strips, used in the investigation emerged successfully from this test.

FIG. 3. PHOTOMICROGRAPH OF FIRST-GRADE GERMAN SILVER TEST PIECE, COPPERED AND SILVER-PLATED. MAGNIFIED 140 DIAMETERS.

Small divergencies in results were noticed between test-pieces made from nickel silver that had been deoxidized and those made from that alloy that had not been deoxidized, the former giving better results than the latter for the same grades of alloys, but the number of the latter used were so few that attention is only drawn tentatively to the result, as the authors intend to make further comparative tests in the future.

Results of Microscopical Examinations.—Samples of every type were carefully examined under the microscope at about 40 and 400 diameters, and in special cases at 1,000 diameters. It was found that in every case, when not submitted to strain, the silver deposit appeared closely adherent, and the microscope did not reveal any marked difference between the nature of the junctions of the deposits with the various alloys. Those pieces from which the silver had lifted after being subjected to severe strain showed that the whole of the silver deposit had left the basis metal, but in the case of the samples of firsts metal coppered before silver-plating, part of the copper had remained adhering to the silver and part to the alloy. The photomicrograph shown in Fig. 3 represents a transverse section of first-grade German silver coppered before silver-plating. The photograph includes a portion of the place where the mark had been struck, and shows the consequent movement of the two metals. The thin deposit of copper between the nickel silver and the silver is clearly discernible as a narrow dark band. This piece shows the three metals in closest contact throughout.

Fig. 4 shows, in transverse section, silver deposited on first-grade metal direct. In one place there is a slight indication of parting, evidently caused by the comparatively rough treatment of sawing and filing given during the preparation of the microsections.

Fig. 5 shows part of a transverse section of a third-grade metal dessert fork with a heavy deposit of silver.

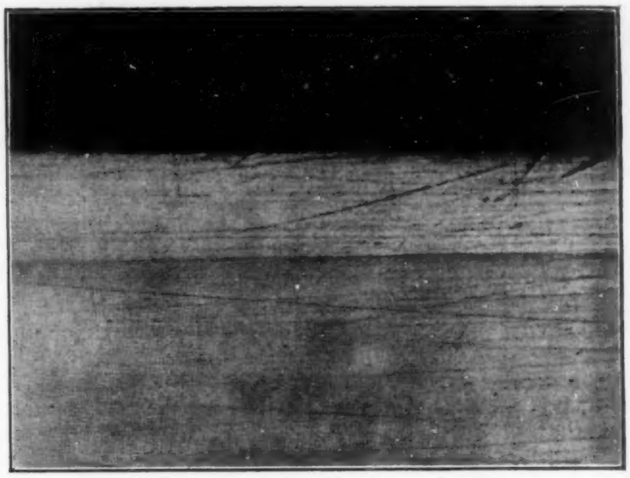


FIG. 4. PHOTOMICROGRAPH OF FIRST-GRADE GERMAN SILVER TEST PIECE, SILVER-PLATED. MAGNIFIED 140 DIAMETERS.

In this specimen, even at the highest powers, the two metals seemed to be in closest contact. The line of demarcation seen in the photograph is due to the difference in color between the metal and the alloy.

The scratches are more prominent in the photographs than the authors would have liked, but as the sections were quite sufficiently free for the purposes of their own examinations and records, they did not, when these were originally made, think of wasting any more time on them.

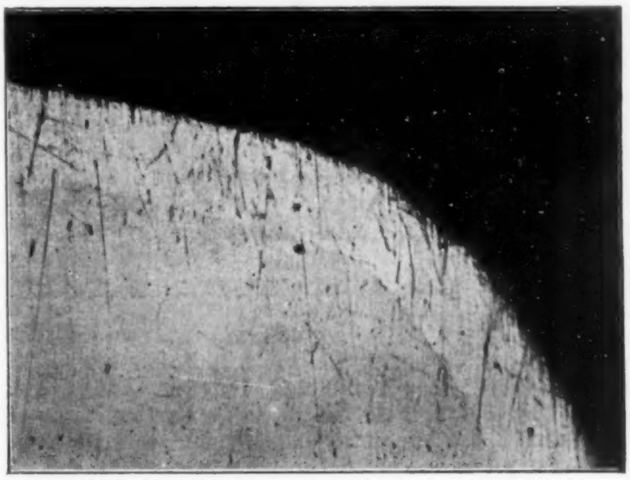


FIG. 5. PHOTOMICROGRAPH OF DESSERT FORK OF THIRD-GRADE GERMAN SILVER WITH THICK DEPOSIT. MAGNIFIED 140 DIAMETERS.

When, however, it was decided that they should lay the matter before the members of this Institute, they repaired to the box where all the sections were stored together in order to prepare them more perfectly and a strange thing had happened. The four most typical specimens which

had been photographed had been left on the plasticene that had been used for temporary mounting purposes, and the sulphur that this useful material evidently contains had strongly attacked the samples during the three years or so they were laid away. Not only had the surfaces of all four sections been much attacked, but the action extended along the junctions of the silver with the alloys so that the idea of repreparing the samples until they were practically free from scratches was abandoned. This would really have been an unprofitable work, for the sections show all that is necessary. In the case of such a soft metal it is also a tedious one, for, in contradistinction to a recently published opinion, the authors find such materials as the comparatively hard tempered steels much more easy to polish than soft metals.

(*d*) CONCLUSIONS.

The investigations clearly indicate considerable differences in the adhesion of deposited silver to the various grades of German silver alloys, even when all are treated under the same conditions of practice, and the authors are of opinion that this fact should have full consideration in choosing a basis metal for articles to receive the thickest silver deposits given, which will also be required to bear rough usage. They are not prepared to state dogmatically that any one particular alloy is best for this purpose, but they consider they have fully proved that ordinary commercial alloys of copper, zinc, and nickel containing more than 14 per cent. of nickel are of doubtful utility in this respect. On the other hand, alloys of the types of G, F, and E used for carrying heavy silver coatings electro-deposited with due care, will endure exceptionally rough usage without giving any cause of complaint on the ground of the silver stripping. It should be noted that the tendency to strip increases with the thickness of the silver deposit. The properties considered in deciding upon the grade of German silver to be used as a basis metal for electro-plating are strength, color, and malleability. As a general rule, passing from G to A in the series of alloys the strength increases, the color approaches more nearly the white of silver, and the malleability decreases. With regard to whiteness, however, where thick coatings of silver are concerned this should not be considered as a matter of such primary importance as the perfect adhesion of the silver under the conditions of wear. Strength is more important than color, and the lower members of the series are deficient in strength; but articles having quite sufficient strength and stiffness can be made of the type of alloy recommended by suitable mechanical and heat treatment.

With regard to the nature of the adhesion, the authors do not at present care to advance any theory to account for the differences described, but as they consider that the quicking process forms a superficial amalgam with the basis metal in the first place, and afterwards on the inner surface of the silver deposit, the two amalgams may form a kind of cement between the plating and the basis alloy. It is possible that with the more suitable alloys this very thin film of amalgam is more efficient than with the alloys of higher nickel content. Hence, although the investigations at present in train are undertaken with regard to the general properties and structures of the series of nickel silver alloys given in Table I, it is intended to note specially any changes in microstructure among the members of the series, with the view of any possible change in the nature of the amalgam that would be produced. They also, for the same reason, intend, with their new series, to examine, with the highest powers of the microscope, a fresh set of specimens after the most careful preparation. The above idea of the nature of the adhesion is supported by the manner of the tearing of the intermediate film of copper, part of which, as already stated, adhered to the silver and part to the basis metal.

A strongly worded appeal has reached one of us to support a demand for foundation alloys of higher nickel content to be used for the thickest coatings, which, if carried into effect, as in many other cases of undue interference of the buyer with the practice of the best makers, would defeat its own purpose of obtaining the best article for the required use. It is interesting to note how the metallurgist has to reconsider the properties of his materials and his methods of manufacture in order to be able to make articles that will do him credit in the world's work when new conditions of life arise requiring these articles to bear a different type of usage. It is no use for him to claim that the usage to which his products are subject is unreasonable, if the new conditions of life require them to bear rougher treatment or some other special strain. He has no say in regard to sociological changes, and if he be wise he will just accept the conditions and endeavor to solve the problem. This was the task placed before the authors, and the practical results of their work have stood the severest trials since their earliest investigations were completed.

The authors have pleasure in acknowledging the kindness of Messrs. W. Gallimore & Sons in rolling their test ingots into sheet.

ITALY'S PRODUCTION OF ALUMINUM.

(FROM UNITED STATES CONSUL CHAPMAN COLEMAN, ROME.)

The only establishment engaged in the production of aluminum in Italy is located at Bussi di Tirino, Province of Aquila. The total output of this plant for 1907, 1908 and 1909 (the figures for 1910 not being available) was 322, 602 and 751 long tons, the selling price of which was $753, $366 and $309 per ton for these years, respectively. The fall in prices, especially in 1908, is stated to have been mainly due to increasing production. The company exported 98, 246 and 62 long tons during these years, and imported 354, 121 and 139 tons. Six hundred and two tons of metallic aluminum were obtained from 4,000 tons of bauxite from this company's fields in the Commune of Lecce né Marsi in 1908, while for the year 1909 the respective figures were 751 long tons of metallic aluminum and 5,000 tons of bauxite.

LIEGE METAL.

[FROM UNITED STATES CONSULAR ASSISTANT BARTLEY F. YOST, PARIS, FRANCE.]

An article of considerable interest to the world of aerial navigation for "heavier than air" as well as "lighter than air" craft is the new metal known as Liege metal. It is said to be 40 per cent. lighter than aluminum and has a density of 1.762. Its surface is grayish-white, reflecting rays analogous to those of poorly worked aluminum. The following is its composition: Aluminum, 0.04 per cent.; iron, 0.01 per cent.; zinc, 0.44 per cent.; sodium, 0.21 per cent; magnesium, 99.3 per cent.

A BLACK NICKEL SOLUTION.

The following solution will give excellent results in producing a dense black finish on metal goods; also will produce a good color upon dead and matted surface:

Double nickel salts	8 ozs.
Sulphate of zinc	1 oz.
Ammonium sulpho-cyanate	2 ozs.
Water	1 gal.

Use a current voltage of one-half volt and old used nickel anodes.

A SET OF PIERCING, SHEARING AND FORMING TOOLS.

By W. H. Walmsley.

In these times of sharp competition, manufacturers of articles consisting of stamped and pressed work from sheet metals, look to their tool and diemakers to design and make tools that will ensure easy manipulation, rapid production and a minimum amount of scrap. The tools described in this article were made with this object in view and proved to be satisfactory in every detail. The article shown in Fig. 7 was produced in these tools and was from 10 M. G. copper and brass. There were three sizes to make, the barrel and the width of the article in each instance being the same, but the distance from center to center of the pierced holes being 1 inch, 1¼ inches and 1½ inches, so the tools were made accordingly to meet these requirements.

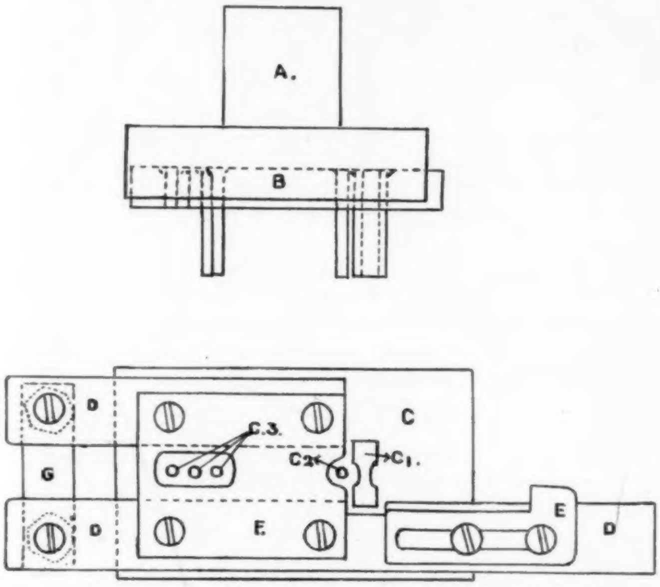


FIG. 1. VIEW OF PUNCH HOLDER AND PUNCHES.

Fig. 1 shows the elevation of punch-holder and punches, and plan of piercing and shearing bed. It is necessary in some instances, to partly make the forming tools first to obtain the correct size and shape of

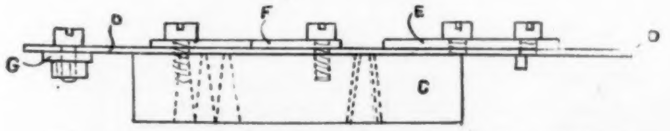


FIG. 2. ELEVATION OF PUNCH HOLDER AND PUNCHES.

the blank. Having determined the particulars of the blank, the bed, C, is carefully marked out for the shearing, C 1, and the piercing holes, C 2 and C 3. These holes being finished and the other necessary screw holes being put in, the bed is hardened, tempered, and ground, and punches made to fit. The method of fixing the punches into the holder in this instance was to fix the punch for C 1 tightly in plate B quite square each way, and then with the punch pushed through the hole, C 1, the plate was clamped to the bed and drilled from the back of the bed through the piercing holes, thus ensuring the holes mitering.

The punch plate can be driven into A by a dovetail groove or screwed on by countersunk screws. The guides D D are then screwed on to the bed C and finished to the width of the stock which is ¾ inches. A strap, G, is fitted to D D to support the metal. The stripper plate F is fixed to the bed by the same screw as D D. The gauge E, to determine the length of the blank, is made with a slot to move up and down as required, and is fixed to D by two screws. Fig. 3 is the raising punch and Figs. 4 and 5 are plan and elevation of the raising die: K on Fig. 4 is the die with the face cut down leaving 0 as a stop gauge, and a groove is cut

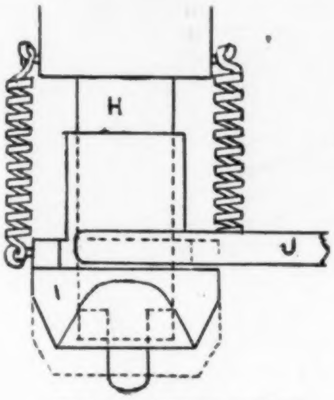


FIG. 3. RAISING PUNCH.

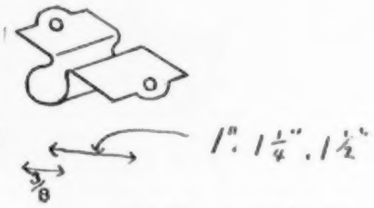


FIG. 7. WORK PRODUCED BY TOOLS HERE DESCRIBED.

is a small block and is hardened, to move up and down to eject the work. N is hollowed out for forming the bottom of the barrel on the article to be raised, and when dead on the bottom of the slot determines the through the right width for raising and allows N, which depth from the face of the bed.

Fig. 3 shows the elevation of the raising punch and collar for ejecting the work from the punch. The raising punch, H, is turned parallel and large enough to file two flat sides for the raising and two flat ends the width of the blank. The sliding collar, I, is bored up slightly larger than the punch and has a flat bottom for the punch to butt upon. A rectangular hole is then cut in to allow the punch to come through for raising. When the punch is butting on the bottom of the hole in the collar, the distance from the end of the punch to the face of the collar is exactly the same as the dis-

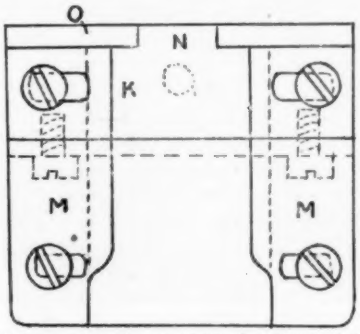


FIG. 4. PLAN OF THE RAISING DIE.

tance from the face of K to the block, N, when resting on the bottom of the slot. The shade portion of I is cut away to miss striking the next blank. The collar is held upon the punch by two springs.

A fairly strong angle plate, L, is screwed to the side of the bed, K, and forms a continuous line with the face. The gauges, M M, are screwed on, and made adjustable for the different sizes, and are undercut as shown in Fig 5 to keep the blanks flat which are pushed in from the front. The ejector pin, P, is turned smaller up to the shoulder, p, and is screwed into N. The collar, p, is made larger to take the bearing of the spring

and determines the height to which N is pushed in ejecting the work. The method of holding the pin, P, is shown on Fig. 5.

At the same time the work is being ejected from the bed, it is also being ejected from the punch by the

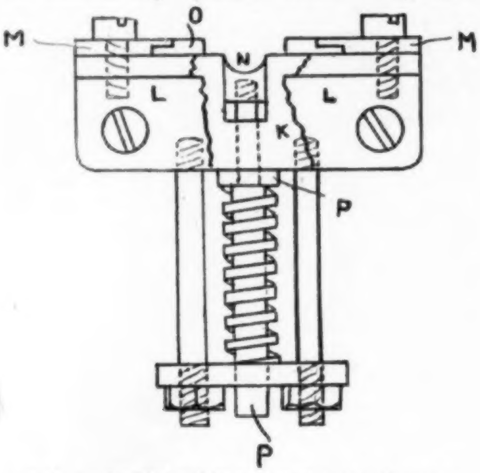


FIG. 5. ELEVATION OF THE RAISING DIE.

upward motion of the press, and the collar coming in contact with the stripper, J. The work being thrown from the tools by the next blank, or should the press be inclined they will fall from the tools by force of gravity. Fig. 6 shows the elevation of the forming tools for finishing the barrel. Q being a mild steel block planed through to take the dies, R R, which work on the pins, S S, these being a tight fit in the block, Q. The drawing shows the dies dead on the bottom of the block, while the dotted lines show the does forced

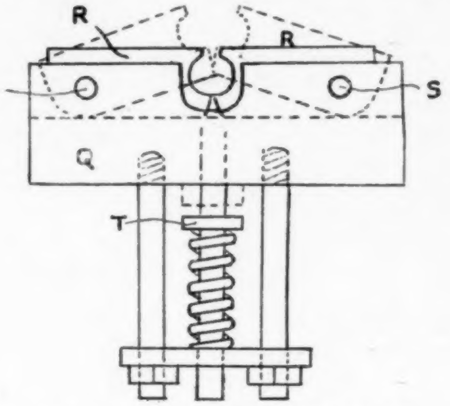


FIG. 6. ELEVATION OF FORMING TOOLS FOR FINISHING BARREL.

upwards and open to receive the work and a round mandrel. A plain flat punch is all that is required to bump the lot home. The pin, T, is to force the dies open to the required width and is fitted in the same way as on Fig. 5.

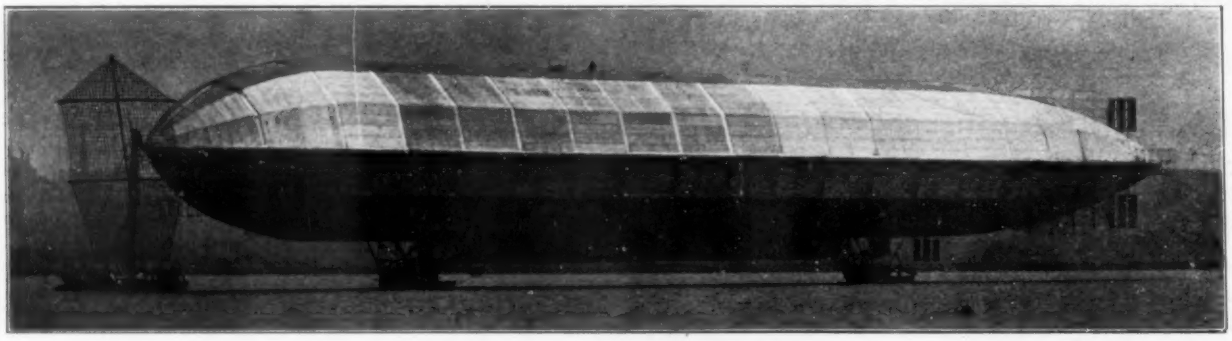
The principles of the construction of these tools can be applied to many other similar kinds of work with equal advantage.

RECENT TESTS WITH DURALUMIN

Some Data Showing the Remarkable Uniformity of the New Light Alloy.

At the works of the Electric and Ordnance Accessories Company, Ltd., at Aston, Birmingham, England, according to "The Iron Monger," there were made some interesting tests of Duralumin. Two test pieces were cut from square bars of 0.75-inch section and reduced in the lathe to 0.401 inch. The first withstood a tensile strain of 7,170 pounds, equal to 25.35 tons per square inch, with an elongation of 26 per cent. and a contraction of area amounting to 0.3 inch, or 44 per cent, and the second showed a tensile strength of 7,260 pounds, or 25.7 tons per square inch, an elongation of 27 per cent., and the contraction of area was exactly the same as in the other case. The uniform results yielded by these experiments in hand show that the company have completely surmounted the difficulties encountered in the earlier days of the alloy when, possibly through lack of experience on the part of those responsible for mixing and casting the metal, the yield exhibited greater variations in character.

The company are now able to supply the alloy in fifteen different grades and to guarantee a tensile strength of 25 tons per square inch, with 20 per cent. elongation, up to 40 tons per square inch, with a corresponding diminution in elongation, according to the particular grade specified. Five qualities are listed, and each is supplied either normal, annealed or hardened, as required. The A quality, normal, has a tensile of 25 to 26 tons, with 20 to 25 per cent. elongation.



THE NEW AIRSHIP, MAYFLY.

The above picture shows Great Britain's giant naval airship, which was recently successfully launched at Barrow-in-Furness, the operations being carried out like clockwork and without a hitch of any kind. The vessel presented a wonderful appearance, the sun striking its silver-gray sides and giving them the color of burnished gold. The airship, the hull of which is exactly 512 feet in length, has been under construction for two years, and has cost slightly more than £40,000, and is the first step which the British Admiralty has taken towards ruling the waves of the air as well as those of the sea.

The Mayfly is a twelve-sided dirigible, with a blunt bow and an attenuated stern. Her framework is of the new alloy, Duralumin, which was discovered by H. D. Weeks, chemist to Vickers Sons & Maxim, the builders of the airship, and adopted by the Admiralty.

The photograph shows the craft just after it came out of the shed. It was afterwards moored to a special buoy in the center of Cavendish Dock. At the stern the wind-screen can be seen, which is to be fitted to the latest addition to our naval and military aircraft. She rests on two gondolas, which contain her engine.

ALLOYS*

W. R. WHITNEY.†

W. R. WHITNEY.

This is not intended as a paper describing accomplishments, but is aimed at contributing, if possible, to increase the interest of experimenters in new alloys. It is the result of reading Mr. Stevenson's paper on "The Value of the Association to Its Members," and a letter from the secretary, asking for a contribution to the papers of the American Brass Founders' Association.

I want to call attention to the possibilities in the way of useful discoveries, which may well lie more nearly within reach of some of the members than they realize, because of their particular knowledge or possession of special materials. For example, it frequently happens that one manufacturing company produces a new metal or alloy for some particular use, which, owing to lack of general study, may remain the sole use for a long period of time. Probably those who produce the special cerium-lanthanum-iron alloy used in the various types of friction cigar lighters, have not been able to study very thoroughly the application of this alloy to other uses. So, also, those who use the very modern metals, tantalum, tungsten and molybdenum, have been engrossed with applications to a single field, and have hardly been able to look carefully into others. It is often through the interchange of information across the gap between quite remote fields that useful advances are made.

It occurred to me that even an imperfect review of some of the relatively recent metals might not come amiss. Probably few realize the rapidity with which new metals are coming into use, particularly in alloys. There are in all approximately fifty metallic elements, though most of our important industries employ but a few of them. Some of these, in the metallic state, have market prices which are not yet controlled by the cost of production, nor by the infrequency of occurrence, but rather by the lack of development of a utility. Beginning with gold, which we may assume is the one element whose exchange value depends upon its commonness in nature plus its cost of production; and passing over iron, copper, lead and zinc, whose values may be said to be well fixed by occurrence and costs of production, we soon reach other metals, for which a new demand might well greatly reduce the cost. Among these are many whose ores occur in abundance. In the case of this type of element the interest attached to research work is doubly great.

It is highly improbable that the cost of copper will ever be greatly changed by the discovery of new uses. This is because the world's supply of the ore is pretty well known; the demands are high and the costs of production of metal from ore have been so studied that further reduction will probably only be of about what I like to call the second order of magnitude. This was not true of the metal aluminum a few years ago, and it is still possible that considerably wider uses and reduction or production costs may develop in its future. There is apparently a much wider divergence between the occurrence of the aluminum in nature and its price in metallic state than in the case of copper. In cases of aluminum, only selected and purified ores are used at present, while other compounds of it occur everywhere in nature. On the other hand, in the case of copper, ores containing even less than 2 per cent. of copper, are worked for the metal. Aluminum may thus still be considered in the transition state, a state long ago passed by copper and iron, and not reached by some of the metals considered below. We have all been witnesses of the interesting advance of aluminum. From 1869-74, its properties were becoming generally known. The inefficient process by which it was then reduced from its ores made it impossible to sell the metal below $10 per pound. Advance was then made so that in the 80's the price was about $5. There was not a great demand for it at this price. In the year 1907, something like 26,000,000 pounds of this metal were made in America alone. The price is now about 20 cents per pound.

The element calcium, which a few years ago was listed only as museum specimens and at several dollars per gram, was sold in 1908 at $1.50 per pound, and could certainly be sold for a small part of this price if a greater use could be found for the metal. It slowly decomposes water, giving hydrogen, and it differs from the alkali metals in producing such a feeble alkaline solution, that it is generally harmless. It ought to serve as a good deoxidizer, and should be a very cheap metal. It is not fair to relegate it to a list of useless metals. History of the metallic arts points to there being no such list.

Thallium is an element quite similar to lead, but probably possessing some property, which will some day warrant its exploitation. It is softer and heavier, and could be obtained in quantity, if a demand were created.

The elements chromium, molybdenum, tungsten and tantalum, the three latter now obtainable in wire form, are tempting elements to study in mixtures with others. Who knows the useful properties of a chromium bronze, for example.

Tellurium has long been an apparently useless metal, and any market price is fictitious, as there is but little isolated in metallic state. It is not necessary that a great use, such as a substitute for zinc in brass, should be found for it. Our industries are so great that if a pound of tellurium added to the ton of aluminum was of benefit to the latter, the production of the necessary tellurium would be real industry.

Consider cobalt a moment. The world's rate of supply of ore has been greatly augmented. It may take time to actually realize a greatly reduced cost of metallic cobalt, but we ought, notwithstanding, to realize it when uses have been developed. Our natural impulse in such a case is to try direct substitution of one metal for another in some well developed use. Cobalt, for example, might replace nickel in most uses when the cost fell below that of nickel, but this is a second order use. A first order use would be the supplying of a want which no metal previously supplied or supplied distinctly less perfectly.

In this connection, an interesting alloy of cobalt and chromium has just been described by Elwood Haynes in the October number of the Journal of Industrial and

*Paper read at Pittsburg, Pa., Convention of American Brass Founders, May 23-27, 1911.

†Research Laboratory, General Electric Company, Schenectady, N. Y.

Chemical Engineering, and it is altogether probable that technical use will soon be made of it.

Many tons of metals are annually consumed as resistance wire for electrical purposes. At one time iron was the element most used. German silver replaced it in some cases, where a lower temperature co-efficient was needed and the increased cost was permissible. Now there are a dozen or more special alloys for this particular electrical use. The new ones have far outclassed the old in most of those properties for which the electrical engineer uses them. In such alloys, nickel, chromium, manganese and others are now used by the ton.

Silicon, which in 1900 was a curiosity and sold for 40 cents per gram, is now a necessary component of special iron alloys and of high grade transformer iron, and the world uses thousands of tons of the alloy annually. Silicon is now sold at about 5 cents per pound. The use of this metal in other alloys is still quite limited. In the case of iron, it greatly decreases hysteresis loss and increases electrical resistance.

Boron, still a quite expensive material in metallic state, is coming into commercial use in assisting the making of solid copper castings of high electrical conductivity.

Vanadium seems to be a young wonder-working metal. Its use has increased very rapidly in the past few years, but the quantities consumed are not known to us. As several companies are producing the iron alloy, it is safe to assume that it is being sold by the ton. The price for the metal in the alloy is not far from $5 per pound.

Cadmium is a beautiful metal in many respects, and it is certainly awaiting use. It is whiter and less crystalline than zinc, and doubtless the high price of nearly a dollar a pound keeps practical workers from trying it in their experiments. It should be produced as cheaply as aluminum, if there were a good demand for it.

Titanium is an element long subject of criminal negligence. It is a high-melting ductile white metal, which, at present, is only separable from its ores at high cost. It exists in many cheap ores widely distributed in nature. It is now apparently coming into use in steel manufacture, particularly for railroad rails, and for this purpose it is fortunately unnecessary to isolate the pure titanium from its ores, an iron titanium alloy being produced directly. What will happen when the pure element has been tried in special fields, can only be surmised. The optimist sees great chances. The pessimist feels himself busy living with the optimist.

ALLOYS, BRASS, BRONZE, ETC.

If one omits the common alloys, brass, bronze, solder, etc., and considers only possible alloys of two metals, and still confines himself to twenty of the common metals, like vanadium, manganese, chromium, boron, etc., he is interested at once to recognize that there must be 190 different pairs of binary alloys. When, in addition, the effect of varying proportions in these alloys is considered, it becomes evident that the field of alloy-research is truly a large one. Many of the alloys apparently unstudied are those which melt at extremely high temperatures.

The brass founder who knows the upper limiting temperature of his melting furnaces may at once point out that this temperature is fixed both by the life of crucibles and the particular coke or oil heating schemes with which he is familiar. If he thought that a molybdenum bronze of 86 per cent. molybdenum, would have useful properties compared with all other alloys, he might at once conclude that he must give up his alloy because of the difficulty of melting it. If it were not for the advances in our available temperatures, there would seem to be little more than amusement in considering alloys high in tantalum, in chromium, in titanium, in molybdenum, in silicon, in uranium, in vanadium and a number of other high melting metals, but hand in hand with the discoveries leading to isolation of such metals go also discoveries of aluminothermics, oxyacetylene and oxyhydrogen temperatures and electric furnace processes. The time is always ripe for the study of new alloys with new tensile strengths, elasticities, colors and wearing powers. The automobile and the aeroplane have forced the aluminum and iron alloys to make rapid strides, and it is natural that we should want to inventory our possibilities. The physical chemist has started along the way of a systematic co-ordination of certain properties of binary, and in a few cases tertiary alloys. He has shown how to plot a few freezing points of two-metal and three-metal mixtures, and to construct therefrom curves showing not only all possible metals, but what may be expected in the way of segregation and structure and such effects as are caused by annealing or quenching.

He has found that there is a solubility of metals in one another which varies just about as the solubility of substances in water varies. Metals may be melted together and well mixed, but the quality and permanency of the mixture is determined by just such solubility laws as control ordinary solutions. We know that in some cases well-mixed melted metals will separate into two layers if allowed to remain even a few moments in molten condition at low temperatures. Such a pair are zinc and lead. They act like a mixture of water and ether. The two separated layers contain both metals, no matter what the temperature, but the quantitative composition depends on the temperature.

The other extreme of metal solubility is found in such a case as zinc-cadmium, which acts much like a mixture of alcohol and water, the two components going into solution in all proportions and remaining in solution at all temperatures. Having seen this analogy between the facts of solubility of substances in water, it is natural to search among the metal mixtures for all the peculiar kinds of solution observed in aqueous solutions. Two such classes interest us at once. They are those corresponding to aqueous solubilities where temperature widely influences the quantities dissolved, and those in which the solvent (as water) combines with the dissolved substance more intimately than by simple solutions, as by chemical combination. In the case of zinc and lead we have one of the metal alloys of limited solubility. If these two metals are well mixed in liquid state, they separate into layers—one, the zinc, carrying a few per cent. dissolved lead, floats on an alloy made up of lead carrying a few per cent. of dissolved zinc. In general, the quantity of the one metal dissolved and held in solution by the other, depends on the temperature, and the higher the temperature the greater the solubility. Between 900 and 1,000 degs. Cent., they are apparently completely soluble. It follows from this that when a dissolved pair of metals is cooled slowly, one of them may separate on cooling, if the limiting solubility is reached, and the extent of effective separation may depend on the rate of cooling.

Our second case, that of chemical combination between the metals, is made most evident by the form of the freezing point curve of the possible alloys. A compound of two metals which is stable at a temperature above the melting point of one or both of the metals, shows very clearly on the melting-point curve

and acts toward each of the elements just as a new, or third, element. Its melting point cannot be predicted from any knowledge of the component metals. It may even melt higher than either of the components. Such cases are seen in alloys of aluminum-antimony, in lead-tellurium, etc.

Man first used the metals as he found them; then, as he reduced them from the ores, and finally, when specified requirements became more and more exacting, he not only brought into use previously unused metals, but also greatly modified the old familiar ones. For a harder iron he used steel, a carbon alloy; for a harder steel, or one capable of cutting iron more readily he added tungsten, nickel, chromium and other metals. For permanent magnets molybdenum was added; for high electrical resistance, nickel, chromium, etc., were added; for low electrical hysteresis, silicon and aluminum were added; for toughness in springs a little vanadium was used, and for wearing qualities titanium is now introduced. These are only a few of the successcessful alloying experiments with iron. They will probably be repeated with other metals, such as copper, zinc and aluminum, where the cost of the base metal is not high.

CHROMIUM.

On the other hand, the study of those metals which have not yet advanced to a stage where first order cost reduction is impossible, is equally interesting. Consider again the element chromium. What do we know about it? Is it a workable metal? Can it be hammered or cast? Is it permanent in the air? Is there a considerable possible ore supply? Has the cost of obtaining the metal been reduced to what seems a reasonable rate? etc., etc. As it is unlikely that such an element will suggest itself for use by men as did copper and iron, it is probable that its properties must first be determined and made known. As a metal, it is only about fifteen years old. It is made in the metallic state by reduction of the oxide by metallic aluminum and also by electrolysis of its salt solutions. It cannot yet be produced at a lower cost than that of the aluminum required, and it now sells at about 80 cents per pound. In the oxide from which it was made, it may be had for less than half this cost, and in its alloys with iron, which are made by direct reduction with carbon, it is sold for 29 cents per pound. This gives a rough idea that ultimately, by perfection of metallurgical processes, etc., we may possibly obtain the metal much below 80 cents per pound. It withstands heat exceedingly well. When pure it melts at very high temperature (Ostwald, about 3,000 degs. Cent.), and it does not scale when heated red hot in air, as copper and iron do. It is for this reason that it is used in resistance alloys for electric heating devices. It has been plated onto metals, and then looks and acts like nickel plate. Doubtless its use will quite rapidly increase in special alloys, as it has already come into use in tool steel.

PATENT CONTROVERSY OVER BEARING METALS.

THE CONTINUATION OF AN INTERESTING DISCUSSION WHICH WAS STARTED BY THE READING OF A PAPER AT THE CINCINNATI CONVENTION OF THE BRASS FOUNDERS' ASSOCIATION, MAY, 1909. ELEVENTH PAPER.

BY ANDREW ALLAN, JR.*

In reading Mr. G. H. Clamer's paper, published in the May issue of The Metal Industry, I find very little need at this time for further discussion on the metallurgy of lead-copper alloys without and with tin. Mr. Clamer, in his March paper, conceded that the Allan process controls the lead in lead-copper-tin alloys, where the tin is in excess of 9 per cent. to 91 per cent. of copper in the mix.

Now, in the May issue, Mr. Clamer further concedes that the Allan process controls the lead in lead-copper-tin alloys, where the tin is less than 9 per cent. to 91 per cent. of copper in the mix, by the fact that he acknowledges that he cannot produce lead-copper-tin alloys as set forth in my diagram, Fig. 1—alloys which are wholly within the teachings of claims made in Letters Patent No. 12,880. Do not these admissions made by Mr. Clamer support my claims that this whole series of alloys depends upon how to control the lead? That the successful application of this art to produce merchantable castings that will not exhibit lead sweat or segregation cannot be accomplished by ordinary foundry practice?

Mr. Clamer is correct. In our No. 1 Bulletin we "decry" the use of tin and make the POSITIVE statement that (Allan red anti-friction metal) Allan metal contains no tin at all. None of our alloys used as lining metals contain tin. We have spent many thousands of dollars advertising that fact. The presence of one-half of 1 per cent. of tin in these alloys—for the very important engineering work for which they are marketed—would materially affect their high efficiency. Allan bronzes are alloys of lead-copper-tin.

In the May, 1911, issue of The Metal Industry, Mr. Clamer states:

> First.—"It has been pointed out that copper-lead and copper-lead-tin alloys are just as different in their properties as any other binary and ternary alloys."

It is a question of degree of difference, for the amount of tin determines the hardness of the copper-rich matrix.

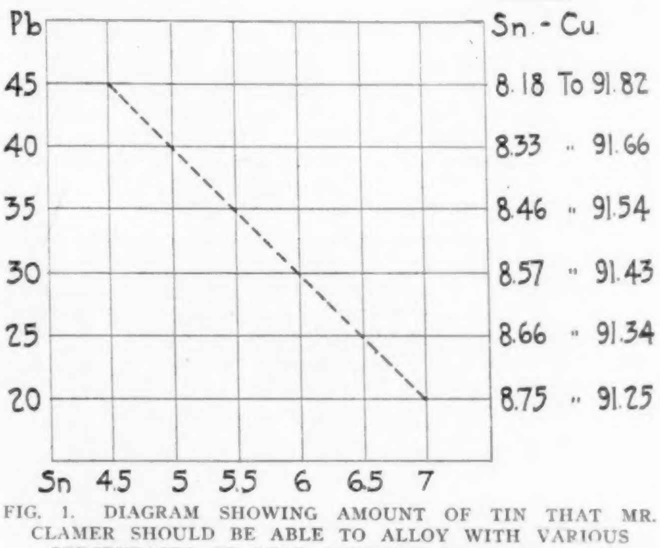


FIG. 1. DIAGRAM SHOWING AMOUNT OF TIN THAT MR. CLAMER SHOULD BE ABLE TO ALLOY WITH VARIOUS PERCENTAGES OF LEAD WITHOUT SHOWING LEAD SWEAT, ACCORDING TO HIS PATENT CLAIMS.

> Second.—"That in the recent suit for infringement on plastic bronze patents, it was decided by two courts that there is no analogy between copper-lead and copper-lead-tin alloys."

I am not basing my argument on the court's decision, but upon scientific knowledge.

*Andrew Allan and Son, New York.

Third.—"Mr. Allan still evades the question which I have repeatedly put to him, i. e., whether he is in a position to prove, beyond a reasonable doubt, that he produced in a commercial way, copper-tin-lead alloys containing less than 7 per cent. tin and more than 20 per cent. lead, balance copper, prior to 1898."

I have absolute confidence in my ability to prove beyond reasonable doubt, that Andrew Allan, Sr., invented the art of alloying lead and copper without and with tin. That a critical relation between tin and copper required to make possible high percentage of lead has not been established. That claims made in Letters Patent No. 12,880 are inoperative, Mr. Clamer concedes

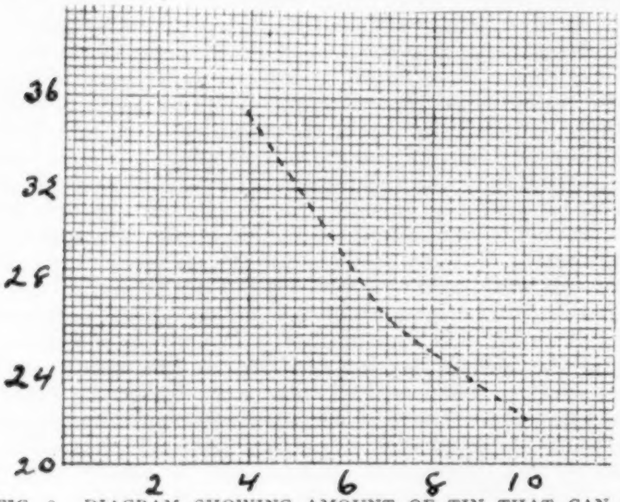


FIG. 2. DIAGRAM SHOWING AMOUNT OF TIN THAT CAN BE PRESENT WITH VARIOUS PERCENTAGES OF LEAD WITHOUT CAUSING LEAD SWEAT.

this by his diagram, Fig. 2, published in connection with his March paper.

Fourth.—"Also if he is producing alloys of this kind at present." (Copper-tin-lead alloys containing less than 7 per cent. tin and more than 20 per cent. lead, balance copper.)

The alloying of our bearing bronzes is governed by the needs of our trade and comprise lead, copper and tin in proportions as we deem advisable to meet any particular service condition.

In the August, 1909, issue of THE METAL INDUSTRY, Mr. Clamer states:

"The difficulty which we overcame was not alloying lead and copper alone, but alloying lead and copper in the presence of tin."

From Reissued Letters Patent No. 12,880 we read:

"To make our improved alloys, the copper is heated and melted until it is thoroughly liquid. The tin and lead are then added in the proportions of under 7 per cent. by weight of tin and not less than 20 per cent. by weight of lead. The alloy is then cast in suitable molds."

Is this the process invented and on which patent rights are claimed? Is this the process that overcomes the difficulty of alloying lead and copper in the presence of tin? Then WHY is Mr. Clamer unable to produce by this process alloys of 59½ per cent. copper, 35 per cent. lead, 5½ per cent. tin and 55 per cent. copper, 40 per cent. lead, 5 per cent. tin—alloys in which the tin and lead are added in the proportions of under 7 per cent. by weight of tin and not less than 20 per cent. by weight of lead?

From Reissued Letters Patent No. 12,880 we read:

"The improvement in the production of copper-tin-lead alloys for BEARINGS, which consists in limiting the proportion of tin to LESS than substantially 9 per cent. of the copper in the mix, and increasing the lead above 20 per cent. of the mix, whereby upon melting and casting a copper-tin alloy substantially free from slow solidifying combinations of copper and tin results, which alloy when cast sets quickly at a high temperature, forming a matrix which holds up all the lead, substantially as described.

In the production of copper-tin-lead alloys for bearings, the described improvement which consists in holding up all of a high percentage content of mechanically-held lead—more than 20 per cent. of the whole mass—by limiting the tin in the copper-tin matrix to below 9 per cent. of the copper, in accordance with the existing CRITICAL POINT in the formation of copper-tin alloys, thereby providing a matrix of copper and tin substantially free from slow solidifying combinations of copper and tin and which on cooling solidifies quickly at a high temperature, thus holding up the lead in any desired amount within the requirements of a bearing and preventing its separation from the copper-tin matrix during cooling, substantially as described."

My readers will note that the patent teaches that tin be present in ANY AMOUNT LESS than 9 per cent. to 91 per cent. of copper in the mix and the minimum limit of lead 20, with a maximum consistent with strength required for solid bearings. Now Mr. Clamer comes out in his May, 1911, paper and concedes that he cannot produce castings which are strictly within the teachings of his patent claims. What is the value of such claims, when the Patentee admits that he cannot accomplish the results which he endeavors to control by said patent?

In the May, 1911, issue Mr. Clamer states:

First.—"In this alloy (copper 55 per cent., lead 40 per cent., tin 5 per cent.) the tin is too high for the amount of lead present."

On what authority does he base such a statement and HOW is it too high?

Second.—"Furthermore, such an alloy would be of doubtful quality for solid bearings, owing to its inability to resist deformation under pressure."

It may be of interest to Mr. Clamer to know that an alloy of 55 per cent. copper, 40 per cent. lead, 5 per cent. tin has as elastic limit of 14,000 lbs. per sq. in., with an ultimate compression strength of 45,400 lbs. per sq. in., quite sufficient for railroad bearings.

Third.—"I have pointed out that tin must be decreased as the lead is increased in order to produce alloys without segregation."

HOW has he pointed out or established this claim?

Fourth.—"The diagram which I submitted with my discussion in the March issue, fully supports the claims of the patent."

Prove that this is true.

Fifth.—"Whereas the diagram submitted by Mr. Allan is not within its teachings?"

State specifically in what respect my diagram is not within its teachings?

Sixth.—"Mr. Allan's 18 years' experience has evidently not been of service to him."

It grieves me to note that Mr. Clamer again deems it necessary to resort to sarcasm. Sarcasm never yet proved a point in a discussion and hardly ever holds the respect of its readers. True, it is an inherent defect in man to overlook his short-comings, and this may be one of my failings, but I always stand ready to be shown.

I fail to see any scientific value in Mr. Clamer's argument put forth in rebuttal to my "assumption," that the addition of lead materially alters the freezing point of copper-tin alloys.

Haycock & Neville's curve shows that the 7.5 per cent. tin, 92.5 per cent. copper alloy freezes between 1030 degs. and 845 degs. Cent. Sir William Roberts-Austen, in his work for the Alloys Research Committee of the Institute of Mechanical Engineers, London, showed that in the alloy with 35 per cent. lead and 65 per cent. copper the copper went solid at 950 degs. Cent. This was recently confirmed by Prof. K. Friedrich (Mitteilungen aus dem Institute für Metallographic an der Königl.-Sächsischen Bergakademie, Freiberg, Vol. 1), the temperature being 955 degs.

Cent. The 30 per cent. lead and 70 per cent. copper alloy begins to freeze out copper about 975 degs. and ends at 955 degs. Cent., as regards the matrix; the lead, of course, freezes at 327 degs. Cent. Now, 30 per cent. lead lowers the freezing point of copper from 1085 degs. to 975 degs. Cent., 35 per cent. lead lowers the freezing point from 1085 degs. to 955 degs. Cent. Prof. K. Friedrich, in a study of the ternary alloys of lead, copper and silver found that copper 90, silver 10 begins to freeze at 1045 degs. Cent. The alloy with 30 per cent. lead and 70 per cent. of the alloy (copper 90, silver 10) begins to freeze about 100 degs. lower. Hence it seemed certain that the addition of 30 per cent. of lead to the (91 copper, 9 tin) bronze must lower the freezing point. An actual record showed that it was lowered about 125 degs. Cent.

In a paper presented at the Franklin Institute in 1903, Mr. Clamer states:

"We were able to produce, without difficulty, alloys with 5 per cent. tin and 30 per cent. lead, but were unable to obtain castings containing 30 per cent. lead, if the tin exceeded 6 to 6½ per cent., nor could we produce castings with slightly over 20 per cent. when 7 per cent. of tin was exceeded."

In my February, 1910, paper I showed photo-micrographs of alloys 67 per cent. copper, 24 per cent. lead, 9 per cent. tin, and 70 per cent. copper, 20 per cent. lead, 10 per cent. tin.

Now, in May, 1910, Mr. Clamer makes the following statement:

"I am perfectly familiar with the fact that copper-lead and tin can be mixed in proportions as set forth by Mr. Allan, HAVING COVERED THIS GROUND A NUMBER OF YEARS AGO, when studying copper-tin and lead compositions in every conceivable combination, SO THAT THE MATTER WHICH HE NOW PRESENTS IS NOT NEW TO ME AT ALL."

Quite a difference in Mr. Clamer's claims in 1903 and 1910.

I call attention to the COMBINATION (over and under 9 to 91) diagram presented by Mr. Clamer. In his May, 1911, paper he tells us that this diagram FULLY SUPPORTS HIS PATENT CLAIMS, and then reprints a paragraph from Letters Patent No. 12,880, and emphasizes the word less. What is the sense in emphasizing the word less and making your diagram show more and then claim they are in keeping?

He states in Letters Patent No. 12,880, that he DISCOVERED THE CRITICAL RELATION BETWEEN TIN AND COPPER REQUIRED TO MAKE POSSIBLE HIGH PERCENTAGE OF LEAD. Why does he ignore this DISCOVERY and produce a diagram part far above and part far below its teachings?

He states, having regards for the critical point and the consequences that flow from it when lead is additionally introduced, all tin-copper-lead alloys divide sharply into those which contain the relative proportions of tin and copper (9to91) and THOSE WHICH FALL OUTSIDE OF THESE LIMITS (over 9 to 91), WHERE THIS IS NOT POSSIBLE. Why does he show the alloys 67-24-9 and 70-20-10 in his diagram, when he tells us in his patent that they are not possible?

Mr. Clamer states:

"The fact that Mr. Allan has not seen castings containing over 25 per cent. lead produced by others is surely no evidence that such alloys are not made. On the other hand, I can produce proof that millions of pounds of metal made in accordance with the above formula have been manufactured, and can also produce analysis of Railroad Test Departments, which have made inspection and analysis in the regular course of business."

It is very true that the fact that I have not seen castings produced by others, consisting of strictly lead-copper-tin, containing over 25 per cent. of lead, that would not exhibit lead sweat or segregation, is no evidence that such castings are not made, nor is Mr. Clamer's statement that he can procure analyses of railroad test departments, evidence that such castings have been made, unless he can produce evidence that said analyses are complete analyses, and even in the case of complete analyses, there are few chemists that would determine the sulphur content of an alloy. I made the statement that I had not seen, nor could I produce these alloys by ordinary foundry practice. I grant that there are millions of pounds of castings on the market, containing over 25 per cent. of lead produced by several manufacturers. I have made examinations of many of these alloys, and have not found a strictly lead-copper-tin alloy, containing over 25 per cent. lead. In analyses made of Plastic Bronze that we have purchased on the open market, we have not found a strictly lead-copper-tin alloy, and how strange, we find they contain as much sulphur as Mr. Clamer states in his August, 1909, paper, that he found in Allan Red Metal.

Now everyone knows that sulphur is not present in market copper or lead. In making up an alloy, it is impossible that an appreciable amount of sulphur can be taken up from coke. Therefore the sulphur must have been added intentionally. WHY?

In Mr. Clamer's paper read at the American Brass Founders' Association, May, 1909, we read:

"This, with a small fraction of sulphur, WHICH IS OF NO MATERIALITY, is the combination made use of by the defendants (Brady Brass Company), who thus admittedly infringe, if the patent is valid."

In August, 1909, Mr. Clamer states:

"I strongly doubt, however, if any beneficial effect is to be derived from its use (sulphur), at least I can POSITIVELY say that lead can be held in a mechanical mixture with copper just as well without it."

THIS IS NOT THE CASE. Sulphur is a factor in the production of lead-copper and lead-copper-tin alloys—it forms a part of the ALLAN PROCESS—its use in the manufacture of bearing metals was INTRODUCED BY ANDREW ALLAN, SR., any one using sulphur to control lead in bearing alloys is using a part of the Allan Process. I claim these alloys cannot be commercially produced without it, also they can only be made within certain limits commercially by ordinary foundry practice assisted by the use of sulphur, falling far below the series shown in my diagram.

Mr. Clamer has stated that he can produce, by ordinary foundry practice, the following alloys:

Copper-	Lead-	Tin
50	50	0
65	30	5
67	24	9

I would suggest that Mr. Clamer send to THE METAL INDUSTRY one hundred pounds of each of the above alloys, THE METAL INDUSTRY to have same analyzed, and if found to be of the proportions called for and strictly lead-copper and lead-copper-tin, to have said alloys recast into merchantable castings under their supervision. If these castings show no lead sweat or segregation, I will willingly assume all cost incurred by this test and concede Mr. Clamer to be one of the ablest metallurgists of the twentieth century.

Mr. Clamer naturally will have no hesitancy in sending these alloys to THE METAL INDUSTRY, thereby proving that the paragraph given below, taken from his May, 1910, paper is true.

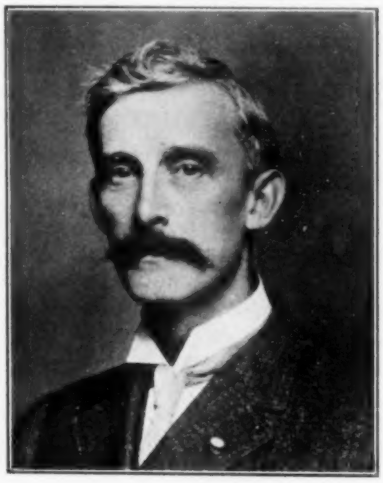
"I am quite well satisfied that the statements made by Mr. Allan in his discussion, which has appeared in this paper, also his circular covering Allan's metal, have not been made with any attempt at deception, BUT ARE ENTIRELY IN ACCORDANCE WITH HIS OWN UNDERSTANDING OF THE FACTS, WHICH, HOWEVER, AS I HAVE POINTED OUT, ARE NOT SCIENTIFICALLY CORRECT."

NON-FERROUS FOUNDRY ECONOMIES AND REFINEMENTS*

SOME PRACTICAL SUGGESTIONS FOR THE LOCATION AND CONSTRUCTION OF A MODERN BRASS FOUNDRY.

BY E. A. BARNES.†

In order to get the best results out of any foundry, it must be the concern of the management not only to take into account the large and apparent items of loss, but to give attention to the minutest details. This is where the intelligent work done by technically educated engineers and chemists can be of great assistance. Up to a few years ago a brass foundry was either an adjunct of the iron foundry or considered one of the least important departments of any manufacturing industry, and even today one can visit large, pretentious plants in which the brass and aluminum foundry is apparently of minor importance. The turning out of the necessary castings from which costly appliances are finally produced, does not receive the expert attention as does the factory itself, in which latter labor-saving devices and schemes of all kinds are found to exist. Many of these foundries are presided over by foundrymen, who, by reason of their experience, are virtually autocrats, and dictate the policy of the foundry methods. This kind of foundry is usually poorly laid out, illy lighted, and the work is done at a disadvantage. This class of foundry, I am glad to say, is fast disappearing, being superseded by those in which engineering skill is employed in the design, equipment and production, and in place of compounding metals from empirical formulae, known usually only to a favored few in the institution, the metals are scientifically compounded from data furnished, classified and checked by an engineer or chemist, whose duty it is to investigate and produce alloys suited to each peculiar requirement.



E. A. BARNES.

The modern foundry, in place of being relegated to the basement or some lean-to at the back of the works, should be designed expressly for the purpose, having in mind not only the rapid and economical production, but the scientific handling and storing of the raw materials, keeping account of the same until they are used on the floor or melted in the furnaces and finally weighed up and turned over to the factory in the form of finished castings.

The building should by all means be fireproof. Many designs lend themselves to non-ferrous metal foundry practice—the saw-tooth having its advocates where land is cheap, and gallery or many-storied buildings where land is at a premium. My preference is for the gallery construction. The lighter brass work and aluminum work can be carried on in the gallery where there is ample light and air. The first floor can be used for the heavier work, the scrap melting furnaces, the power plant, office, cleaning departments, store rooms and other miscellaneous uses not strictly connected with the actual melting and molding.

HEATING.—The heating of a foundry is one of the important considerations. I personally prefer to use direct radiation, derived either from coils of iron pipe built along the walls under the windows, or sectional cast iron radiation similarly placed. With a little scheming this radiation is out of the way of the molders' benches, molding machines and sand. Placed under the windows it radiates the maximum amount of heat, tempering the air and distributing it evenly over the building.

VENTILATION.—Ventilation is another important point that must be taken into consideration. In saw-tooth and gallery constructed buildings, the lanterns in the roof should be arranged with swinging windows; the natural tendency of the heated gases being to rise and pass out the same. This action can be augmented by the use of fans, which are absolutely necessary in a building built of more than one solid story.

OFFICE.—The foundry foreman's and clerk's office should be arranged so as to afford a full view of the shop, yet be quiet and so closed in as to be free from the dust and dirt that is inseparable to any foundry. Suitable desks, chairs, card indexes, filing cabinets, etc., should be supplied, as no foundry can be properly conducted unless adequate means are at hand with which to keep records of weights, input and output.

PATTERN STORAGE.—We have found that the best form of pattern storage is secured by the use of heavy wire netting mounted on light angle iron supports. These racks are fireproof, the sand that sticks to the patterns eventually falls off, sifts through the meshes and in place of remaining among the patterns, gravitates to the floor where it can be swept away. The racks being open permit of inspection and ready identification, even if the pattern is ranged on one of the upper shelves. They are strong and practically indestructible. Some system of numbering and arranging these patterns is, of course, necessary. The match-plates can be stored standing on edge in suitable metal racks and receptacles where the chance of injury is remote.

METAL STORAGE.—When it comes to the storage of expensive metals and supplies, these should be located in burglar and fire-proof vaults, centrally located, not only to the melting floors and office, but to the freight elevator which serves the upper stories. It may be even advisable to build store rooms on the upper floors, connecting these with the main floor storage by limited capacity electric hoists.

SAND BIN.—The sand bins should be so arranged that the sand can be unloaded through adjustable chutes or conveyor system from freight cars or wagons economically and rapidly, and be distributed only as occasion requires to the molding floors and core room.

CRUCIBLE STORAGE.—In our foundry we have arranged the store room for crucibles, fire brick lids, and other supplies that are likely to be affected by the absorption of moisture, in a brick vault heated to a considerable degree by the passage of spent furnace gases through suitable ducts under the floor of the vault. Shelving is arranged in this vault for the storage of cores that have been baked but are not yet required.

CORE OVEN.—For a number of years we have successfully employed a core oven built in line with the main flue gas vent. The spent gases from the furnaces pass through cast iron ducts built to constitute the floor of the core oven. These ducts are controlled by hinged dampers which can be deflected so as to pass the gases directly up the stack. When it becomes necessary to bake large cores,

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the heat in this oven is augmented by the use of an oil burner connected to the main fuel system.

WELFARE.—It is desirable, and it is, in fact, becoming a law in many States, that a foundry shall be equipped with suitable toilet rooms in which modern conveniences must be installed. In our foundry we have individual, hygienic wash bowls, allotted to each employee, with running hot and cold water. Each man is furnished with a metallic locker in which to store his street clothes. Shower baths, needle baths and dressing rooms are provided with hot and cold water. With these facilities, the men can make themselves entirely comfortable and presentable before leaving the premises. One of the floor helpers acts as janitor for this department and keeps it in a sanitary condition. It is an undeniable fact that these accommodations are not only used, but are appreciated by the men. To the unprogressive manager, these things appear unnecessary refinements, but our experience of several years has proven to us conclusively that for our forethought and outlay we get a better class of men and a higher grade of work with less complaint than was possible before these arrangements were installed.

POWER PLANT.—One of the principal features of foundry installation is the power plant. In the power plant are situated the pumps for pumping the oil, the operation of the blowers for combustion air, air compressors for the hoists, rapping hammers, squeezers and burner atomizers. This plant should be in a separate room by itself, the machinery being laid out on the unit system. By "unit system" I mean that individual motor-driven fan blowers combined with a slow speed multi-cylinder pump for forcing the fuel oil to the burner should be arranged. These units should be of sufficient capacity to take care of three melting furnaces and a ladle heater. The object of this unit system is that an accident to a motor or pump only involves the shut-down of a limited number of furnaces. One of the fire underwriters' requirements is also complied with, i. e., an accident to a motor or blower at the same time shuts down the oil pump; consequently there is no danger from incomplete combustion of quantities of fuel oil which without the attendant supply of oxygen generates explosive gases. Each system should be equipped with suitable shut-off valves, expansion chambers, drainage valves and by-passes, enabling the system to be drained free of oil every night.

METERS.—Suitable meters should be installed in connection with each unit so that the exact amount of fuel oil used for the melting of metal can be ascertained with fair accuracy. My plan is to connect two meters in tandem and take out the oil for the burners between the meters. The differential reading between the meters, which have been adjusted to run accurately in series, gives or indicates the true amount of oil that has been consumed in the furnaces. This differential scheme is necessary, as no meter has yet been found that will accurately measure the small amount of oil burned in even three or four furnaces. It is necessary here to state that the volume of oil thrown by the pumps is passed through regulating bypass valves back into the suction side of the pump.

As the economical operation of the foundry depends in a great measure upon the uninterrupted operation of the power plant it is advisable to have the plant under the management of the works mechanical department and separated from the foundry influences entirely. If this is not done, the foundry people, who rarely have any interest in or experience with machinery, allow the same to run down. Temporary patching up is resorted to in order to put off the evil day, and high grade, expensive machinery quickly deteriorates through neglect. If the plant is under the control of the operating department, expert supervision and care are assured.

AIR COMPRESSOR RADIATORS.—In connection with our air compressors, of which we have several installed, we have arranged special automobile radiator cooling devices through which the jacket water is circulated the instant the air compressor is started. When the air compressor is put out of service, the water ceases to move; the motive power being a smal piston pump connected on the end of the air compressor shaft. The re-use of the water is quite an economy in itself. If city water is employed it is usually wasted into the sewer. The operator forgets to turn it on and explosions have known to result; he forgets to shut it off and many gallons of water, that may cost ten cents a thousand, are wasted. Most city water contains large quantities of lime and magnesia in solution, and these coming in contact with the heated walls of the air compressor precipitate in the form of scale. This scale cuts down the radiating capacity, the air compressor overheats and the efficiency is very greatly reduced. Not only this, but due to the pressure the water in the jackets has been known to leak through the packing and get into the cylinders, causing wet air with its attendant troubles. With the closed automobile radiator system, condensed steam or rain water is used, the furring and liming-up effect is entirely avoided and the same water can be used for months with slight additions from time to time to make up for the leakage around the pump plunger, etc. It is well to state at this time that these radiators are designed to properly dissipate the amount of heat generated in the cylinders and absorbed by the water.

OTHER EQUIPMENT.—Other desirable equipment of the up-to-date foundry includes band saws, sprue cutters, tumbling barrels, saw filing devices, sand mixers, etc., etc. These should be direct connected to individual electric motors. The initial cost may appear a little higher with this arrangement than if installed with a single motor and line shaft, but the disposition and arrangement of the several tools can be much more economically and practically proceeded with if one is not tied up to a line shaft drive. Any single machine can be run independently of the others very efficiently if the motor has been properly selected with regard to the work to be done. Such other apparatus as monorail carriers, cinder grinders and washers, magnetic separators and schemes for skimming off the ladles before pouring, etc., are available and can be selected to suit the various requirements.

LADLE HEATER.—Our ladle heaters, which are arranged to use the same burner, are made with a telescoping hood that is raised up when the pouring crucible is introduced and then dropped down enveloping the same. In this way the crucible is evenly heated. We find these ladle heaters very useful for getting out small batches of work, as the heat generated in them can be as high as that produced in the larger furnaces.

(To be continued.)

MECHANICAL PLATER HINTS.

The operator must acquaint himself with the best method of handling his particular class of work; in handling some light, polished work the cylinder must be filled nearly full and run slowly; this will avoid nicking and scratching the work, while in plating large heavy pieces the cylinder is not filled so full; but, usually, in either case a strong current must be used to bring out the desired color. Each class of work will require a little different method of handling, slight changes in amperage and voltage, or in density of solution, or time required for proper deposit, or possibly in the speed at which the cylinder is revolved. These are small points but all have a bearing on the final result, and if we would be successful with the mechanical plater, we must have these details well in hand.—H. J. HAWKINS.

PROPOSED STANDARD SPECIFICATIONS FOR THE VIRGIN METALS COPPER AND SPELTER, AND MANGANESE BRONZE ALLOYS.

At the annual meeting of The American Society for Testing Materials, held at Atlantic City, June 27-July 1, 1911, the committee B2 on standardization of specifications for non-ferrous metals, Chairman Dr. William Campbell, certain specifications governing the purchase and sale of copper, spelter and manganese bronze were recommended. The society in meeting moved to adopt them and the secretary was ordered to send them out to members for letter ballot as per constitution.

The specifications proposed are as follows:

SPECIFICATIONS FOR COPPER WIRE BARS, CAKES, SLABS, BILLETS AND INGOT BARS.

1. MARKS: All wire bars, cakes, slabs and billets shall be stamped with the maker's brand and furnace charge mark.

Ingots and ingot bars shall have a brand stamped or cast in, but need have no furnace charge mark.

2. LOTS: The refiner shall arrange carloads or lots so that each shall contain pieces from but one furnace charge so far as possible, in order to facilitate testing by user.

3. QUALITY.—

(a). Metal Contents: The copper in all shapes shall have a purity of at least 99.880 per cent. as determined by electrolytic assay, silver being counted as copper.

(b). Conductivity: All wire bars shall have a conductivity of at least 98.5 per cent. (annealed) and all ingots and ingot bars shall have a conductivity of at least 97.5 per cent. (annealed) excepting only arsenical copper, which shall have a conductivity of not less than 90 per cent. (annealed).

Cakes, slabs and billets shall come under the ingot classification, except when specified for electrical use at time of purchase, in which case wire bar classification shall apply.

The "Annealed Copper Standard" or resistance of a metergram of standard annealed copper at 20 degs. Cent. shall be considered as 0.15302 international ohms. Per cent. conductivity for the purposes of this specification shall be calculated by dividing the resistivity of the annealed copper standard by the resistivity of the sample at 20 degs. Cent.

4. PHYSICAL STANDARD: Wire bars, cakes, slabs and billets shall be substantially free from shrink holes, cold sets, pits, sloppy edges, concave tops and similar defects in set or castings. This clause shall not apply to ingots or ingot bars, in which case physical defects are of no consequence.

5. WEIGHTS OF INDIVIDUAL PIECES: Five per cent. variation in weight or one-quarter inch variation in any dimension from the refiner's published list or purchaser's specified size shall be considered good delivery, provided, however, that wire bars may vary in length one per cent. from the listed or specified length, and cakes three per cent. from the listed or specified size in any dimension greater than eight inches. The weight of ingot and ingot bar copper shall not exceed that specified by more than ten per cent., but otherwise its variation is not important.

6. CLAIMS: Claims must be made in writing within thirty days of receipt of copper at the customer's mill, and the results of customer's tests shall accompany such claims. The refiner shall be given one week from date of receipt of complaint to investigate his records, and shall then either agree to replace the defective copper or send a representative to the mill. No claims will be considered unless made as above stated, and if the copper in question, unused, cannot be shown to the refiner's representative.

Claims against quality will be considered as follows:

(a.) Conductivity by furnace charges, ingot lots or ingot bar lots.

(b.) Metal contents by furnace charges, ingot lots or ingot bar lots.

(c.) Physical defects by individual pieces.

(d.) Variation in weights or dimensions by individual pieces.

7. INVESTIGATION OF CLAIMS: The refiner's representative shall inspect all pieces where physical defects or weight or dimension variation is claimed. If agreement is not reached the question of fact shall be submitted to a mutually agreeable umpire, whose decision shall be final.

In a question of metal contents each party shall select a sample of two pieces. These shall be drilled in the presence of both parties, several holes approximately ½ in. in diameter being drilled completely through each piece, scale from set to be rejected. No lubricant shall be used and drilling shall not be forced sufficiently to cause oxidation of chips. The resulting samples shall be cut up, mixed and separated into three parts, each of which shall be placed in a sealed package, one for each party and one for umpire if necessary. Each party shall make an analysis, and if the results do not establish or dismiss the claim to the satisfaction of both parties the third sample shall be submitted to a mutually agreeable umpire, who shall determine the question of fact, and whose determination shall be final.

In a question of conductivity each party shall select two samples and in the presence of both parties these shall be rolled hot and drawn cold into wire of 0.080 in. diameter, which shall be annealed at approximately 500 degs. Cent. Three samples shall be cut from each coil and the same procedure followed as described in the previous paragraph.

8. SETTLEMENT OF CLAIMS: The expenses of shipper's representative and of umpire shall be paid by the loser, or divided in proportion to the concession made in case of compromise.

In case of rejection being established the damage shall be limited to payment of freight both ways by the refiner for substitution of an equivalent weight of copper meeting these specifications.

EXPLANATORY NOTE: These specifications are intended to allow for the fact that the refiner produces copper and gauges its quality in furnace charge lots, while the user purchases copper in carload lots, necessarily obtaining a different basis for sampling.

It is intended to cover in these specifications an average grade of copper suitable for all mechanical uses and for making alloys to be used in various wrought forms.

It also recognizes the fact that certain shapes are largely put to electrical uses where high electrical conductivity is important.

It does not take into consideration the so-called casting copper used for the purpose of alloying with other metals to produce cast shapes.

SPECIFICATIONS FOR SPELTER.

Under these specifications Virgin Spelter, that is, spelter made from ore or similar raw material by a process of reduction and distillation and not produced from reworked metal, is considered in four grades, as follows:

A High Grade
B Intermediate
C Brass Special
D Prime Western.

MARKS: A brand shall be cast in each slab by which the maker and grade can be identified.

LOTS: The maker shall use care to have each carload of as uniform a quality as possible.

COMPOSITION.

A.—HIGH GRADE: The spelter must not contain over
0.07% lead
0.03% iron
0.05% cadmium.
It must be free from aluminum
The sum of the lead, iron and cadmium must not exceed 0.10%.

B.—INTERMEDIATE: The metal must not contain over
0.20% lead
0.030% iron
0.50% cadmium.
It must be free from aluminum
The sum of the lead, iron and cadmium must not exceed 0.50%.

C.—BRASS SPECIAL: The metal must not contain over

0.75% lead
0.04% iron
0.75% cadmium
It must be free from aluminum

The sum of the lead, iron and cadmium must not exceed 1.20%.

D.—PRIME WESTERN: Must not contain over

1.50% lead
0.08% iron.

PHYSICAL: The slabs must be reasonably free from surface corrosion or adhering foreign matter.

SAMPLING: Not less than 10 slabs shall be taken as a sample from each car. For smaller lots in the same proportion to the total number, but in no case less than three slabs. In case of dispute half of the sample is to be taken by the maker and half by the purchaser; the whole to be mixed.

The slabs selected as samples are to be sawed completely across and the sawdust used as a sample. In case no saw is available for this purpose the slabs should be drilled completely through and the drillings cut up into short lengths. The saw or drill used must be thoroughly cleaned. No lubricant shall be used in either sawing or drilling, and the sawdust or drilling must be carefully treated with a magnet to remove any particles of iron derived from the tools.

ANALYSIS.

LEAD: For the determination of lead in High Grade not less than 25 grams; Intermediate not less than 15; Brass Special not less than 10; Prime Western not less than 5 grams must be taken, that is, the sample used for analysis should not contain less than 0.01 gram lead.

IRON: The sample for iron should contain not less than 25 grams for the three higher grades and not less than 10 grams for Prime Western. The entire sample must be dissolved, the iron precipitated as ferric-hydroxide, then redissolved, reduced and the iron determined by titration.

CADMIUM: Dissolve 25 grams in 330 c.c. of a solution of one part of hydrochloric acid (specific gravity 1.2) and five parts of water. Let it stand over night; filter and wash; reject filtrate and dissolve the residue, which should be about 5 per cent. of the zinc, in nitric acid. Add 10 c.c. of sulphuric acid; evaporate to fumes; dilute and filter out and wash the lead sulphate. Dilute the solution to 500 c.c.; add 5 grams of ammonium chloride; pass a slow stream of hydrogen sulphide for one hour and let stand for about five hours; filter, wash with hot water; dissolve in 10 c.c. of sulphuric acid and 50 of water; filter and wash. Dilute to 400 c.c.; precipitate with hydrogen sulphide as before. Weigh as cadmium sulphide or dissolve in hydrochloric acid and titrate with potassium ferro-cyanide.

CLAIMS: To be considered must be in writing within thirty days of receipt of material at customer's mill and the results of customer's test must be given. The shipper shall be given one week from date of receipt of such claim to investigate his records and then shall either agree to satisfy the claim or send a representative to the mill.

a.—ANALYSIS BY CAR LOTS: No claims shall be considered unless the minimum samples as specified for the grade in question can be shown such representative.

b.—PHYSICAL DEFECTS OF INDIVIDUAL PIECES: No claims shall be considered unless the spelter in question, and unused, can be shown such representative.

MILL TREATMENT: Where the spelter satisfies the chemical and physical requirements of these specifications it shall not be condemned for defects of alloys in which it is used or for defects in the coating of galvanized products.

INVESTIGATION OF CLAIMS: The maker's representative shall inspect all pieces where physical defects are claimed. If agreement is not reached the question of fact shall be submitted to a mutually agreeable umpire, whose decision shall be final.

On a question of metal contents an adequate sample shall be drawn by the representatives of both parties; the sample shall be prepared from the slabs so selected as described under *Sampling*. The sample shall be mixed and separated into three parts, each of which shall be placed in a sealed package, one for each party and one for the umpire if necessary. Each party shall make an analysis and if the results do not establish or dismiss the claim to the satisfaction of both parties, the third sample shall be submitted to a mutually agreeable umpire, who shall determine the question of quality and whose determination shall be final.

SETTLEMENT OF CLAIMS: The expenses of the maker's representative and of the umpire to be paid by the loser or divided in proportion to concession made in case of compromise.

In case of rejection being established, damages shall be limited to the payment of freight both ways by the maker or substitution of an equivalent weight of spelter meeting these specifications.

MANGANESE BRONZE INGOTS.

CHEMICAL COMPOSITION: The composition to be copper, 55-60 per cent.; zinc, 39-45 per cent.; iron, not over 2 per cent.; tin, not over 2 per cent.; aluminum, not over 0.5 per cent.; manganese, not over 0.5 per cent.

This specification is intended to cover manganese bronze ingots, having notched flat bottoms, approximately 3 ins. thick by 2¾ in.s wide by 12 ins. long, properly tapered to strip easily from an iron mold.

PHYSICAL PROPERTIES: Ultimate tensile strength not less than 70,000 lbs. per square inch.

Elongation in 2 ins., not less than 20 per cent.

TEST SPECIMENS: The standard turned test specimen, as shown by Fig. 1, page 59, Volume IX, of the Proceeding of the American Society for Testing Materials, ½ in. in diameter and 2 ins. gauge length, shall be used to determine the physical properties as specified above.

NUMBER AND LOCATION OF TEST SPECIMENS: One test ingot shall be selected by the inspector to represent 10,000-lb. ingot or fraction thereof. The test specimen shall be cut from one corner near the bottom of the ingot.

In case the test specimen shows a flaw, two additional tests may be selected by the inspector from the same lot, and tested, to represent the lot in question.

MARKING: Each furnace charge shall be kept separate until the lot is sampled by inspector, and each ingot thereof stamped with its proper heat number. When ingot is sampled at destination various heats can be mixed in shipment, but must be stamped with their proper heat number.

REJECTIONS: All ingots in each lot will be accepted or rejected upon the physical tests, or chemical composition, irrespective of the heat or heats from which the test ingots are selected.

In case the buyer's tests show the material does not meet these specifications, the seller shall have an opportunity to inspect the material and each party shall select a sample for retests. If the results do not agree each shall select a sample to be sent to a mutually agreeable umpire whose decision shall be final. The costs of such tests shall be paid by the loser.

SHERMAN ANTI-TRUST LAW VIOLATIONS.

The determination of the United States Government to prosecute so-called trusts which it believes are operating in violation of the Sherman Anti-Trust Law, has resulted in the indictment of 83 officers connected with the companies engaged in the manufacture of wire, including a number of the officials of the corporations which manufacture copper wire and kindred products.

Among the associations and corporations whose officers were indicted are the following: Bare Copper Wire Association, Rubber Covered Wire Association, Underground Power and Cable Association, Telephone Cable Association, Wire Rope Manufacturing Association, Weatherproof and Magnet Wire Association, Lead Encased Cable Association, Fine Wire Magnet Association, American Electrical Works, Ansonia Brass & Copper Company, Benedict & Burnham Manufacturing Company, Coe Brass Manufacturing Company, National Conduit & Cable Company, John A. Roebling's Sons Company, Standard Underground Cable Company.

NICKEL PEELING OR STRIPPING.

Some Causes and Cures.

By J. H. Hansjosten.

The following lines may be rehashing a very ancient subject, one that the older and more experienced platers may be inclined to smile at, but it may also stir within them memories of by-gone days, coupled with worried evenings and sleepless nights, the latter, being given mostly to thinking of what to do next to that solution to stop the nickel from peeling. But even if these lines will not benefit any of the "older heads," methinks there are many young men, not so far on the road to fame and fortune (?), or perhaps just starting on that avenue, via the plating room, to whom they may be of some interest, and let me be just egotist enough to say, of some benefit. I will not attempt to classify the various reasons, or causes, for nickel peeling, I will just state them as they come to mind while writing, and give what my experience has taught me, are the best remedies for overcoming the trouble.

Whenever a nickel solution gives a deposit that will not adhere to the work, find out, first of all, the cause of the trouble. Don't blame it on the solution unless you are positive that the blame belongs there. To simply accuse the solution of being the cause of the trouble and immediately doping it up with this, that, and the other thing, is worse than folly. You will simply ruin your solution and add to your troubles, for I venture to say that in nine cases out of ten, the trouble lies somewhere else. My advice to the man who encounters trouble of this kind is, look to the cleaner or cleaning first. Be sure that the work is chemically clean before it goes into the plating bath. This has been harped on so much that it is thumb and finger worn, but the saying, "Cleanliness is next to Godliness" is nowhere more applicable than in the plating room.

A few years ago the writer was requested to go over a plating plant where from 15 to 35 per cent. of the work peeled or stripped while being buffed. The only thing wrong was in cleaning the work. The plater in that plant did not like to use very much potash, because he said it made his hands sore, and it took a plain talk on the part of the writer to induce him to make his potash strong enough to cut the grease, so that a brush and pumice stone would take it off. Of course, he was not up-to-date, or he would have had an electric cleaner, but then, at that time electric cleaning solutions were not in as general use as they are now. But I am not speaking of electric cleaners, I am only inserting this, to show the importance of having the work clean before plating.

Another thing that might be investigated as a possible source of trouble is leaving work in the rinsing tank too long before putting it in the solution. Work left in water for even a short length of time will become covered with a film of dirt caused by the impurities in the water. This is very adhesive, but unfortunately does not make the deposit so. Work covered with this scum or film will very often peel; it is therefore policy to get the work in the plating-bath as soon as possible after it is cleaned. This can be easily arranged by not cleaning any more work than can be quickly removed from the rinsing tank to the plating tank. It is also good policy when hanging in a bundle of work to keep the work in the solution, while holding the bunch in one hand and looping the wires around the work rod with the other. It certainly does not improve the work to let it dry between the rinsing and plating tanks. If the deposit is forced on by too strong a current the deposit is apt to peel. I am inclined to think that next to unclean work this is the source of more trouble than anything else. The remedy is obvious and easily applied. Simply reduce the current. And now to say a few words about the solution:

A nickel solution in which iron and steel is plated is apt to become acid and give a poor and not very adhesive deposit. The plater should watch for this by testing the solution with litmus paper at stated intervals, and if it shows too much acid use enough carbonate of nickel to bring it back to nearly neutral. Bicarbonate of soda and liquid ammonia are used by many platers to reduce the acidity of a solution, and both work very well; the writer, however, has always found carbonate of nickel to be more satisfactory, but care should be exercised in using it, for too much of it will not do a solution any good.

If a nickel solution is used for plating brass or for that matter anything that is dipped off in cyanide, it is apt to become alkaline. This is an unhealthy condition and will cause trouble. Double salts will usually correct it, but it may sometimes become necessary to use acid, particularly when the solution is rich in salts and it is undesirable to increase its density or specific gravity. If acid must be used, use it carefully and remember it is easier to add more to the solution than to remove it or neutralize it if too much has been put in.

In passing let me say this. To have as little trouble as possible, keep in touch with your solutions, be acquainted with them, always know what is in them, and remember that the simpler your solutions are the easier they are kept right. A solution should contain nothing that is not absolutely necessary. Those barbarous days in the history of plating, when each plater had, or professed to have, a formula of his own, and which was his own cherished secret, to be given to the young plater only under the promise of absolute secrecy on his part and the payment of a sum of money are gone by and are a matter of history, and it is a good thing they are. For with the disappearance of the old secretive ways, the many dopes and ites and ates have been relegated to where they belong, nowhere! No plater today is afraid to say that a nickel solution consists of nickel salts and water, and for all practical purposes that is nearly all it should contain. The only time it is necessary to use anything else is when trouble occurs, such as I spoke of above. But we do not need to use other things if we go about it in the right way, and that again brings me back to clean work. For I think I am not exaggerating much when I say that most of the things in a solution that should not be in are brought into it with dirty work.

If, for instance, a bundle of brass work that has been swished in potash and dipped in cyanide is not thoroughly rinsed in water, it carries cyanide into the solution, causing it to become alkaline. The same is true of iron or steel work, which will carry acid into the solution, causing it to become acid. It then becomes necessary to use chemicals to counteract the action of the above, which would be unnecessary if care had been used in the first place, i. e., in cleaning the work properly. Sometimes, in some plants, the solution is covered with floating dirt and grease. If a plater allows that condition to exist, it is very probable he need look no further for the cause of his peeled work, if he has any, and the writer is very much inclined to think he will have some. Keep the dirt and scum off by rinsing the solution as often as is

necessary. It will take a little time, but it will save a lot of work and worry.

Make your solution right in the first place. Use double salts and water. If you must have a white background, use single salts with double salts, but use the single salts sparingly, for it will make your deposit hard and brittle and it will peel easily. Be sure your current is not too strong, for it is cheaper for your employer to run your work ten minutes longer in the plating bath than to loose 10 or 15 per cent. of it through peeling. And be sure that your work is chemically clean, and that all connections are as tight as possible.

ESSENTIALS OF BADGE DESIGN.

By Lawrence B. Robbins.

ORIGIN.

With the remarkable growth of machine made products which has taken place within the past fifty years the output of jewelry has increased to such an extent as to appear little short of marvelous. The hand made jewelry has been so rapidly superseded by the machine made article as to be almost obliterated from the display of the ordinary jewelry store, and it seems fair to assume, as a likely consequence, that in a few years to come a genuine "hand made" jewel will be looked upon as almost a curiosity. In the days gone by the designer was only limited by the size of his customer's wallet and his own skill in working the precious metals. His artistic ambition could be realized by giving superior workmanship its full sway, and the design its intended meaning, for wealth demanded originality and richness while the aforesaid condition produced it.

Today, however, it is different. Jewelry, so-called, is worn by everyone, rich and poor, as a result of the introduction of automatic machinery in the trade, and consequently the production of the hand made article is reduced to an almost unrecognizable minority. It seems reasonable to suppose that every civilized man, woman and child today possesses one or more pieces of jewelry. Conventions, societies, colleges, public schools, churches and in fact every social body of people demand a button, pin or badge bearing the insignia of their union. Some of these are undoubtedly fine productions of the modern jeweler's art, but the major part are of such a character as to call for rapid, cheap and altogether inferior workmanship and material. The badge is a natural outgrowth of the old fashioned jewel, and as it is the most noticeable of this group of personal ornaments, I will endeavor to roughly outline the chief conditions and methods which underlie its design and manufacture.

MAIN PECULIARITIES.

As stated in an article entitled "The Successful Jewelry Designer" published in the May, 1910, issue of The Metal Industry, badge designing is an art peculiar to itself, insomuch that although the designer must be artistic in his laying out and treatment of the subject, he should also be inventive and capable of carrying out his ideas in a practical manner. Secret societies planning to convene at some stated period of time for an annual biennial, or triennial gathering as the case may be, usually desire a badge embodying something typical of their home town or city, and some literal or pictorial reference of their meeting place. Some orders, say for instance the Mystic Shrine, lean decidedly towards the humorous, and the badges manufactured for them for former conventions are conclusive evidence of the humorous strain possessed by the designers of these affairs, who might have to turn to the next job before them and plan something of a more formal and serious nature. This shows then that the true badge designer *must* be a versatile person, capable of coping with innumerable problems bearing on widely different motives.

ESSENTIAL FEATURES OF A BADGE.

The essential features of a badge may be summed up somewhat as follows:

1. Size.
2. Metals employed.
3. Number of units.
4. Enamels.
5. Coloring and finishing.

SIZE.

Taking size as an average of comparison one will have to admit it is to be left to the best judgment, either of the manufacturer or the conditions governing the taste of the purchaser, but under ordinary circumstances the badge, when assembled, should not exceed three and one-half or four inches in length. This is only a fair estimate, of course, some designs running either much larger or smaller. Size naturally suggests weight, so assuming the badge to be struck out of medium gauge metal, say No. 14, an approximate weight of 30 pennyweights, anyway not over 2 ounces, should be sufficient to warrant a lasting and altogether substantial production. The designer must bear in mind, above everything else, that a small, neat and well balanced badge is in far better taste, and stands a far better chance of getting into society, than the heavy, bungling affair, designed without regard to even the crudest details of proportion or utility.

EXAMPLE OF BADGE DESIGN.

METALS EMPLOYED.

The metals employed in the modern badge are principally brass, copper, bronze and gilding metal, with an

occasional call for silver or gold. As a general rule, however, brass, copper and gilding metal constitute the three most commonly used, when the estimate on the badges run from, we will say 5 cents to 50 cents apiece.

NUMBER OF UNITS.

By the number of units I mean to imply the various pieces employed to make the badge complete, either of metal, cloth or otherwise. The simplest, of course, is the one-piece badge and assumes almost the nature of a medal. The most popular seems to be the two-piece badge, that is, the bar and pendant, and is often set off by a plain or multi-colored ribbon as a background suspended from the bar, which by the way, is often done with the best of intentions but very poor taste. Badges of three, four and even five pieces are not uncommon, but I hardly believe that the end always justifies the means. Building a badge of a number of pieces calls for greater cost than if built of a single piece. The more pieces, the greater number of tools, increased cost of labor in finishing and assembling, and greater difficulty of design.

The problem offers ample opportunity for careful thought and study and as the reader can readily see determines the initial cost of the production.

ENAMELS.

Enameling is an art as old as art itself. It has had its eras like every other application of art, but today one finds the use of enamel little short of wonderful. Its application to badge work within the past few years has been very extensive, the best enamels being imported from Germany, Switzerland, Sweden and Japan.

While enamel work beautifies jewelry—guard against overdoing it. Indiscriminate use of color will vulgarize your work quicker than anything else, while a touch here and there or a well studied spacing of good, quiet, well balanced color is most commendable. Avoid tattooing your designs with color and half the game is won.

COLORING AND FINISHING.

To color and finish a badge effectively requires great skill and appreciation of art on the part of the colorer. What the designers puts on paper the colorer may not be able to duplicate, either through the same lack of skill or immunity to distinguish good from bad. This is the one bone of contention. The various metals can be finished in ten thousand different shades and colors, so to speak, and one can readily see what a difficult task it is for the designer and colorer to agree, but after all strive for simplicity in color treatment and easy shades to duplicate and the results will prove the worth of the "simple way." Badge design is an art in itself, peculiar to itself and when well done shows for itself. Let the designer understand that neatness coupled with high ideals in his art and execution will be the biggest asset he can hope to attain and the results of his labors will be ample recompense for his striving.

THE CHEMISTS LAMENT.

By B. W. Gilchrist.*

The following lines were inspired when the National Electro-platers' Association of the United States and Canada made electro-chemists, as distinguished from "chemists," eligible as "active" members of the association:

Why should there a distinction be
Between those versed in chemistry?
Must not they all be in position
To use electro deposition?
The laws of Faraday apply?
Full oft' a task to simplify?

Yet a surprising thing we see
Writ in The Metal Industry.
The warning King Belshazzar saw
Upon the wall, stands as of yore,
Proclaiming chemists all to be
Found wanting who are not "E. C."

By-laws which are in use today
And govern the N. E. P. A.,
Declare that foremen platers and
Electro-chemists take the stand,
No chemist who is not electro
Can join nor really should expect to.

Kirchhoff—Thou didst devise, they say,
The spectroscope we use today,
And with Von Bunson to assist,
Didst make spectrum analysis.
Why did you not possess the brain
"E. C." to sign behind your name?

Lavoisier! You deserve the fate
Robespierre put upon thy pate,
Not because you—wet your chew
And phlogiston overthrew;
But that you did neglect for shame
To put E. C. behind your name.

Proust, in thy controversy long,
With Berthollet you proved him wrong,
And though you left to us as fixtures
The answer to compounds and mixtures,
You will have hard work to explain
Why E. C. does not grace your name.

Wohler—it was most a schism
To waste time on isomerism;
What though Berzelius was thy chum,
You'll find in ages yet to come,
You in the background must remain—
There's no E. C. behind your name.

Priestley—were you alive today,
Folks in Northumberland, Pa.
Would put you down among the fools
Who for the elements make rules
Instead of teaching them the game
Of signing E. C. to their name.

Gay Lussac, you of France's men,
Had scientific acumen;
Yet more fame would have won if thine
Endeavors not on idoine
Or acids spent, sought higher plane
By penning E. C. to thy name.

Cavendish, pray tell us this:
Did you and Avogadro miss
The molecular weight of gases
Confined within the heads of asses?
I think so, when immortal fame
Means adding E. C. to a name.

Space, Mr. Editor, find soon
To show up things so picayune
And narrow-minded; let them be
Fought by The Metal Industry.
Your paper might condone a fault,
But on hair splitting call a halt.

*Foreman Plater, Kelly Jones Company, Greensburg, Pa.

THE FOUNDRY PATTERNMAKER*

SOME PHILOSOPHICAL REMARKS REGARDING THE STATUS OF THIS IMPORTANT PERSONAGE.

By W. H. PARRY.†

The term "A Foundry Patternmaker," is an opprobrious name sometimes hurled at the head of any poor unfortunate who, in the raffle of this world's chances for a means of making a living, happened to draw the opportunity to learn his trade under such conditions that gave him a fine chance to size up what the molder had to contend with in the line of badly constructed patterns —patterns that were made in many instances by good woodworkers who had as much conception of the art of molding as a jackass has of the science of astronomy. Yet, this class of patternmakers are largely in the majority today for the reason that the old-fashioned shops are fast disappearing and the opportunities for the acquisition of foundry knowledge are confined to large manufacturing plants who number a foundry as one of the component parts of a complete whole. Yet, even under such favorable conditions we have all met that paragon of stupidity who has served his time in such a place, and whose excuse for not knowing more of foundry practice is that he was not allowed to enter the foundry except on errands for his foreman, whose instructions always were to hurry back, "as the foundry was no place for a minister's son," or at least a highbrow artisan, such as patternmakers are apt to class themselves with.

What this country is coming to in the light of what is happening to our young men who have taken up patternmaking as a means of livelihood is hard to say. But this much I will venture to predict, that, unless there is a very decided change in the methods employed in instructing the young patternmaker how to shoot, the foundrymen who come after us are in for a very interesting time. The conditions are such in my home town at least, that it is almost impossible to induce any young American to take up molding or patternmaking as a life work. So we have to fall back on the foreigners, and it must be said in their favor that they will make almost any sacrifice to gain the necessary knowledge and experience. This digression is pardonable because of the necessity for proving that the conditions at present are not favorable to the making of a first-class foundry patternmaker.

CONSTITUTION OF THE PATTERNMAKER.

Now, what is a first-class foundry patternmaker? First, he is a man who has served enough time in a foundry as a molder to have learned that molders are also mechanics and, if he is a fair-minded man, he realizes that, considering the means that molders use to turn out good castings, that they are, man for man, even better mechanics than the generality of patternmakers. Having once allowed this to sink into his cranium, he is in a position to respond to any little suggestion that the molder may make looking to the betterment of foundry conditions.

Second, experience has taught him that to slight the pattern work only entails more work on the molder, and when we stop to consider that the molder's tools consist largely of a sand heap and some boxes (either iron or wood) and proper, and in many cases improper, means of handling the same, it is surprising that they are able to do as well as they do. The foundry patternmaker realizing these conditions, does everything in his power to make patterns that can be molded with the least possible labor by the molder, which means, of course, a greater output. I do not know of anything that will compare with poor patternmaking as a means of restricting the output of any foundry. Those of us who have been "up against" the task of making castings from patterns made in the various jobbing pattern shops in our locality, can appreciate indeed how little the owners of said pattern shops know or care as to whether the castings can be made or not from such "creations" as they are wont to make. This brings up the crying necessity of teaching young men who serve their time in such shops the first rudiments of the molding art, at least, so that they will not be foisted upon a long-suffering line of other shops to which they eventually gravitate to, in their search—not for knowledge—but the almighty dollar. In fact, I have met with middle-aged men who had never worked anywhere else but in jobbing shops, and whose knowledge of molding was of a kind that made molders weep and—swear.

Next we will take up as briefly as possible several little things that go to make the foundry patternmaker. He never fastens anything on the cope side of his pattern that ought to be loose, and whatever is fast is given enough draft to insure a perfect cope lift. He never allows his patterns to leave his hands with lumps of glue right in line with the deepest lift. He never expects a molder to stop off five feet from a six-foot pattern. He never forgets to provide lifting straps when necessary; he never has his dowel pins so tight in dowel holes that it would take a Sandow to part the pattern. He never provides a very shallow ring when he wants a very deep drum cast from it by the never-to-be-forgiven process of lift a half an inch and ram a half an inch. He never allows a pattern to leave his hands until it has received at least two coats of varnish, and by varnish I do not mean jobbing shop varnish, but that of a good grade that will not shed its coat on the sand if it happens to remain there for any time over five minutes. He never forgets to mark the loose pieces properly, so that their correct position on the pattern is not a matter of guess. He never places rapping plates on patterns in such crazy positions that the molder cannot possibly use them. He never would be guilty of making patterns with "back draft." He never expects that because they use cranes in the foundry that it would be an infallible method of lifting patterns from the sand, hence they need no draft; and he never, never makes the remark that anything is good enough for a molder.

RELATIONS OF PATTERNMAKER AND MOLDING MACHINE.

Now, in these days of the molding machine, the foundry patternmaker looms up as a very important man indeed, and, notwithstanding that molding machines have been used pretty extensively for these many years, it was my misfortune to meet a patternmaker not six months ago who admitted to me that he had never heard that such vile things were in use. After he had worked for us awhile I believed him, as his head proved to be made of solid ivory, judging by the lamentable showing he made on some very simple pattern work. On molding machine pattern work, my advice would be to any patternmaker who aspires to become conversant with the game, to forget some of the old-established rules and train his mind to the new conditions, so that when called upon to produce patterns that can be plated or stripped, he will know enough to make them in such a manner that the molding machine operator does not have to do any thinking or patching in his efforts to make a showing with his

*From a paper read at the Boston meeting of New England Foundrymen's Association.

†Superintendent, National Meter Company, Brooklyn, N. Y.

machine. Here's where our old friend, the foundry patternmaker, will be on the job once more, delivering the goods as of yore, be it bench work or floor, with or without core.

In this connection, it may or may not be in the best of taste to mention the claims of a very well-known jobbing shop located where the mighty waters of Niagara flow, who claims, at least, the post card he distributes with so lavish a hand, does the claiming for him. That he is able to judge how the patterns should be made to fit either squeezer or jolt rammer, and whose knowledge of the requirements of each was gained in two visits to the exhibits of the Foundry and Manufacturers' Association. If his work on patterns other than those to be used on molding machines is any criterion as to the class, I'm sorry for the poor dupe that falls for his "dope," as without question the kind of work turned out at this establishment is the poorest of all jobbing shops, and to expect molders to turn out any kind of a day's work with such patterns is little short of a crime. I want to assure my hearers that there is no personal feeling in this matter, but it makes one's blood boil to think of the effrontery of men whose chief mission on this earth is to create trouble for molders, and who are on the job morning, noon and night. As I have mentioned before, if there is any one class that can cause more trouble than the chesty jobbing shop proprietor, I have yet to hear of it.

I will cite an instance of very recent occurrence that will convince you of the need of a foundry patternmaker in one shop at least. A jobbing foundry, one of the largest in the country, recently installed a jarring machine and the salesman, as all such do, told them that their handy man would be fully competent to set patterns on plates, so that they would be relatively correct to the pins. Acting on these instructions they proceeded to place a gas engine cylinder pattern on two plates, so that they could ram up, say a half a dozen copes from one plate, then change over and ram up the same quantity of drags. Everything went lovely until they yanked the castings out, and then consternation reigned supreme, as it was found that each half of the casting lapped over the other halves about half an inch. Aha! did they seek the cause as mechanics would have done? Not so, Rudolph; they went for the molder and the flask maker and accused both of being responsible for a "shake" in the flasks; then they tried the flasks and found that they were all right. Then, and not until then, did they examine the plates, only to find out that their handy man was a very unhandy man, indeed, when accuracy of position was desired, so that they made another stab at it, and, when the next batch of castings were turned out they were just as bad, only, they lapped the other way! Then they cursed the machine and its maker, and it was a good thing for him that he didn't happen to visit them just about then, as he might have been blessed. After they had cooled down, they decided that their class of help was not of a kind that would make a success on that machine, so they consulted with a man experienced on that class of work and he lent them a man, who fixed them up in good shape.

So I say that the foundry patternmaker is the man to cotton to in these days of the molding machine, and if you've got one in your employ that can do all these things, he is worth his weight in platinum to you, and I would say the same of any good molder. Such, for instance, as a man who was recently asked to turn out fifty molds a day, 12 ft. x 16 ins. x 5 ins., with eight patterns on a Tobin bronze plate, so made that by the use of false cores it was possible to make the castings in a two-part flask with an extra roll over. Considerable thought had been devoted to the method of assembling the patterns and we were patting ourselves on the back that we had struck a pretty good thing, but the first day's work was very disappointing, and the second was but little better. The molder then suggested that instead of eight individual false cores that we make a frame to drop on the plate so that it would surround all the patterns, thus making one large false core instead of eight little ones. He also suggested that we change the draft in certain places, which was done, and because of these two changes, we got a very good day's work, though it is but fair to admit that we didn't get the fifty molds that we were after, as we found that it was a physical impossibility for any one man to do it in nine and one-half hours.

Perhaps some of you have had the experience of trying to hire metal patternmakers who were conversant with up-to-date molding machine practice. And possibly you have had the heart-rending troubles incident thereto, such, for instance, as hiring men who claimed to have all the necessary experience that makes for a first-class man, only to find in a very short time that they were mere pattern filers whose knowledge was decidedly limited, and who knew absolutely nothing of molding machine practice. Indeed, it is a question whether some of them even knew what the word "draft" meant. If you have not been through this mill, I stand before you as a horrible example of one who has, and with your permission I will recite the facts, hoping that some one will benefit thereby. It's all very well for the molding machine salesman to tell you that all you have to do is to put the patterns on the plates and the machine will do the rest. I fell for that line of talk once, but never again, as I very soon found out that not only was there considerable to the proper placing of patterns on a plate, but that the molding machine men themselves, at their home plants were not able to set patterns on a plate properly. There was nothing to it but to buckle down to the game and organize our own force in such a manner that these troubles would cease for all time. To that end we pressed into service some young men who had served their time with us as wood patternmakers, and to say that they made good right from the start was very gratifying, and when you come to think it over, there was no good reason why they should not, as they had a fair working knowledge of foundry practice to the extent, at least, of knowing what draft really meant.

As a result, we have a force of men today who can make their own master patterns and by master patterns I mean real master patterns, so made that there is the very minimum of finish allowed, and the workmanship to pass muster must be of the best. The same men, then, are able to finish the brass patterns and top it all off by setting them on molding machine plates and make a trial mold before the rig is returned to the foundry. I will not deny that wood patternmakers, as a rule, do not care for metal pattern work, but as I have explained to them many times, that in this age of molding machines the more versatile a man makes himself, the better and more valuable he becomes to himself and employer, or to use plain English, the more money he is going to earn. Of course, there are exceptions here and there, and I know of a case where a former wood patternmaker has entirely given up chewing lumber and devotes his time to metal patterns entirely.

PLATER'S WRINKLE.

Flemish iron is produced upon imitation hammered iron work by coating with dead black Japalac, drying, then rubbing down with emery and a little oil. The surface is then lacquered to protect against rust.

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ASSOCIATIONS AND EXHIBITIONS

To many the letter from Dr. Richard Moldenke, secretary-treasurer of the American Foundrymen's Association, published in the Criticism and Comment columns of this issue of THE METAL INDUSTRY will be a big surprise. To those more or less on the inside and in a position to be familiar with conditions as they are, it is not unlooked for. There has been noticed a growing tendency for the past two years for one association to attempt to dictate in a certain sense to the other. Last year, when arrangements were going forward for holding the convention and exhibition in Pittsburg there was a hitch and it looked as if there would be a break, matters being fixed up at the last moment. Perhaps as it turned out it would have been better had the associations held their meetings in a separate hall some distance from the exhibition grounds, for it looked at Pittsburg as though the associations had been relegated somewhat to the rear; this being particularly true of the American Brass Founders' Association.

Now according to Dr. Moldenke the allied foundrymen's associations have committed themselves to Buffalo for the 1912 convention, while the executive committee of the Foundry and Machine Exhibition Company have rejected that city as an exhibition possibility and are looking up other cities. This state of affairs is to be deplored and we hope may yet be altered by a heart to heart conference as the genial doctor suggests. The plan as laid out so far for the holding of the convention and exhibit in Buffalo seemed most excellent and it seems a pity that it could not be tried out. We refer to holding the exhibit in one part of the city and the association meetings in another as described in THE METAL INDUSTRY for June. The interest, it seems to us, would then be self-centered and one function would not interfere with the other.

At first thought it seems as if each society was necessary to the other, but upon analysis we find that this is not the case. It is self-evident that the associations in their present standing are bound to survive by themselves, but it is by no means so certain that the exhibition could long exist on a paying basis without the co-operation and interest of the allied associations. The societies formed for purely educational and uplifting purposes can stand alone, having self-centered interests, while the Exhibition Company, formed for purely business reasons, certainly must depend on the buying public for its existence and continued success.

Would it not be just as well, then, when conditions

are as at present, to try this out and hold the two events in different cities? The associations could cut their convention time to, say, three days, and the members could then, after attending their meetings and reading their papers, go on to the exhibition and devote their time and interest to the business end. Perhaps the exhibition could be held once in two years and thus be made more of a "new idea" show than is possible in yearly outlays. THE METAL INDUSTRY invites its readers to express their ideas on the subject and offers its columns for the exploiting of opinions.

DISCUSSIONS

This issue of THE METAL INDUSTRY is replete with discussions. The most important, perhaps, in point of age and general interest, being the eleventh paper in the "Controversy Over the Patent Situation Regarding Bearing Metals in the United States," written by Andrew Allan, Jr., of New York. This discussion started in July, 1909, from a paper read at the Cincinnati Convention of American Foundrymen, by G. H. Clamer, of the Ajax Metal Company, Philadelphia. During the two years intervening there have been eleven papers presented alternately by the two contestants, Mr. Allan having written six and Mr. Clamer five. Some very valuable matter relating to lead, copper, tin alloys has been given and the whole discussion, now drawing to a close, makes very interesting reading from a metallurgical standpoint.

In the "Criticism and Comment" department of this number of THE METAL INDUSTRY will also be found some expressions of opinion from one of our English cousins in relation to the matter of nickel plating. This is in reference to an article written by Percy S. Brown, published in THE METAL INDUSTRY for January and February, 1911. This article was criticized by "Electro," an electroplating expert, who for business reasons preferred to remain unknown. This discussion has consisted so far of five papers, three written by "Electro" and two by Mr. Brown, the last paper by "Electro" appearing in the June number, being unanswered as yet by Mr. Brown. As "Electro" announced that that paper was his last one, we will look with interest for Mr. Brown to close the discussion. The criticism by Prof. Bonney, instructor in metal coloring at Northampton Institute, London, England, and author of "The Electroplaters' Hand-Book," emphasizes what we welcome in our writers' articles, viz., simplicity and clearness so that the uninitiated into chemistry's mysteries can understand and find the matter interesting.

In the same number we have also an expression from Prof. Bonney relating to the wooden leather-covered polishing wheel which is very interesting. The early history of the polishing business is not very well known and the articles just published, by T. C. Eichstaedt and Theodore Schesch (THE METAL INDUSTRY, February and June), serve to give a good idea of the progress of the development of the polishing wheel in its many forms. Frederick A. Tolhurst also gives us a good outline of the principles of the drying process for small metal articles embodied in his new machine, the centrifugal dryer. Some wrong impressions seem to have been entertained regarding the centrifugal method for drying small articles of metal. Mr. Tolhurst's letter will serve to clear away the doubts and give a good idea of the merits of the system.

Thus it will be seen that the "Readers' Opinion" columns of this issue of THE METAL INDUSTRY cover a wide diversity of interests and yet there is a continuity of subjects that is surprising. Starting with the plating of articles the matter runs through the polishing to the final "drying out," or finishing. It is not often that we can offer such a variety of matter in any one issue and we congratulate our readers and ourselves in being able to present it.

THE METAL INDUSTRY makes no pretence at being any sort of a judge of the merits of the points scored by either contestant in a discussion or controversy, but aims to print matter that is interesting to its readers and its columns are open at all times to free, impersonal, dispassionate discussion and criticism of the articles published in its issues.

NEW BOOKS

"Good Engineering Literature." by Harwood Frost. Size, 5½ x 7¾ inches. 422 pages, including Index. Bound in cloth. Published by the author, Chicago, Ill. Price, One Dollar. For sale by THE METAL INDUSTRY.

This book, which is a valuable treatise on the subject of engineering literature, has been written with a view of suggesting what to write, and how to write, to those who are desirous of having occasion to prepare articles on scientific subjects. As the author aptly remarks in his preface, "Every engineer is sooner or later called upon, in the course of his professional duties, to do some form of literary work, when he finds that the ability to speak and write clearly and forcibly, to express his thoughts and understandings and to describe his works so that others will understand them, will prove one of the most valuable items in his mental equipment. This fact is, however, too little appreciated by the average student, or by the engineer during the earlier years of his work and as a result, we see many struggling engineers painfully groping their way and struggling with the difficulties of composition under conditions where success depends on their powers of persuasion or of making themselves clearly understood." For such as these this book is written, and we do not believe that anyone, even though he be an expert in the preparation of scientific matter, can fail to derive valuable benefit from a study of the work.

The book itself is composed of twenty-two chapters, including an index. These chapters cover the entire field of scientific writing and include instructions as to literary expression, governed by rhetoric, grammar, orthography, punctuation, etc., and also gives numerous suggestions as to methods for choosing subjects and how to prepare various kinds of engineering literature. A chapter is devoted to the explanation of the copyright law and another to the relations between author and publisher. The preparation of illustrations for reproduction as embodied in the wax engraving process, photo-engraving and lithography, make up the material for another chapter, which is followed by a most interesting one devoted to the making of a book.

The author of this book is a graduate of Lehigh University, Bethlehem, Pa., and of McGill University of Montreal, Quebec, and was formerly editor of The Engineering Digest, and manager of the Engineering News book department, New York, and by reason of his wide experience in technical literature is well qualified to act as an authority on the subject matter contained in the book. We predict that this book will prove of great value to every student, instructor, contractor, librarian and engineer.

CRITICISM AND COMMENT

WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

DRYING AND BRIGHTENING METAL GOODS WITH HOT AIR AND CENTRIFUGAL DRYER

To the Editor of THE METAL INDUSTRY:

In view of the fact that some statements have been made concerning the above that would tend to mislead the manufacturer of small metal goods, I beg the attention of the readers of THE METAL INDUSTRY to a few points about which so much has been written. In preface I beg to say we built and installed self-balancing centrifugal dryers for a number of small metal manufacturers as far back as 1894, but it was not until 1906 that I applied hot air for the purpose of expelling the moisture that centrifugal force would not act upon and I believe I was the first to exploit this combination for metal work. It was soon after this that I discovered by experiment that air heated to certain fixed temperatures forced into a rapidly-revolving mass of some metal articles actually brightened them as in the case of safety pins, hooks and eyes and buckles, as well as other similarly-made articles. There are some manufacturers of plated steel and iron articles who obtain approximately the same results. Whether the brightening comes from chemical or mechanical action has been a matter of speculation by all who have used the process.

The discovery was made after repeated experimental attempts to produce a finish comparable to that obtained by tumbling in sawdust. I wish to say in explanation of this discovery that I carried on my experiments with a view of obtaining an abrasive agency and finally decided upon air. I based my calculations on the assumption that the air is laden with minute particles of matter (as in a small metal-ware factory the matter would consist of minute particles of metallic dust). When heated sufficiently these particles of solid matter would expand and if driven with sufficient force into the rapidly-revolving mass of metal articles would produce a cyclonic action in its effort to escape, having but one way out, and that through the perforations in the sides of the retainer. Now, in its passage around and through the aforesaid mass with terrific force, the heated, expanded particles in the air furnished me the abrasive agency I sought, the result being a finish quite comparable to that of sawdust in most classes of work. This action of hot air does not, as some have been led to believe, remove any metal or acid stains, but merely removes the film or oxidation following exposure to the air. There never would be acid stains on work if properly rinsed. My statements regarding this process have been verified in practice, both in Europe and America.

As for drying out articles having "deep depressions" or "those that contain only one outlet," as referred to in Charles H. Proctor's contribution on "The Use of Sawdust as a Drying Material" in THE METAL INDUSTRY for March, 1911, I beg to criticise that writer for saying that the centrifugal dryer is inadequate and not commercial. Such a statement is misleading. If cup-shaped articles like thimbles, which are tapered, get "nested" and have not been agitated as they ought to be to shake out surplus water his statement is so far correct, but unless such articles are nested with a quantity of water in them he is wrong. There are hundreds of articles made with "deep depressions," like cartridge blanks for example, that will not "nest" and it matters not what position they take in the container or basket of the centrifugal dryer, the heat, and its rapid circulation raising the temperature of the articles by friction of the air, expels every particle of moisture.

Mr. Proctor also states, in effect, that if the relative position of one article in respect to another could be made to change during the operation the centrifugal dryer would meet all the requirements and "prove itself a commercial success." For the benefit of those unfamiliar with some of the conditions prevailing when a centrifugal dryer or extractor is in action, it is relevant to state that there is a pressure against the sides of the revolving basket or retainer of 100 to 200 pounds to every pound of material constituting the load, varying according to its weight, diameter of basket and speed at which it revolves. Therefore, to introduce some agency like a device or contrary force by which articles traveling, for instance, 10,000 feet per minute, could be changed in their position in relation to each other would result in very serious damage. Any reciprocating motion could not possibly be made to overcome the centrifugal force that holds the articles in one position.

What the author of "The Use of Sawdust" objects to as a limitation in the commercial value of the centrifugal dryer can be, and is daily overcome by the following procedure where there is any doubt about its adaptability. When the centrifugal is started and runs gradually to top speed the articles constituting the load, which should never exceed one-half the total capacity of the basket, moves and distributes itself on the sides. At the expiration of a minute after top speed is reached, release the power and apply the brake and the basket comes to a standstill quit suddenly, causing the articles to fall back to the bottom of the basket, thus changing their relative positions. Then, by quickly releasing the brake and applying the power, the articles return to the sides, but not in their former positions. By following this simple method any moisture not thrown off in the first position will generally find its way out in the second, the whole operation consuming not more than four minutes usually.

I have never known this manner of handling articles with "deep depressions" to fail in giving satisfactory results. I respect and appreciate the opinions of the learned author of "The Use of Sawdust" and presume he believes what he says is true, but I am sure if he were to investigate the results of the "Tolhurst Process" in such noteworthy establishments as Waterbury Mfg. Company, A. H. Wirz, of Philadelphia, Pa.; Krementz & Company, of Newark, N. J.; Siemens-Schukert Werke, of Berlin, Germany, and Eid'g'-Munitionfabrik, of Thun, Switzerland, as well as many others, he would find that articles such as he mentions, containing deep depressions or those having but one outlet or opening, like a cartridge blank or metal collar buttons, can be and are thoroughly dried out by centrifugal force and hot air.

In defense of a statement in the June issue of THE METAL INDUSTRY, made by our Mr. Alfred Sang, of Paris, in reply to "The Use of Sawdust as a Drying Material," that he knew of 5,000 gross of hooks and eyes being dried out in three minutes by centrifugal, it seems only fair to state that there are many kinds of dress fasteners made. There is one, cup-shaped, with a nipple fitting tightly into it and it is quite presumable that Mr. Sang had in mind this kind of dress fastener, but being once a long-time resident of America he inadvertently spoke of it as a hook and eye, most all dress fasteners going by that name in America.

FREDERICK A. TOLHURST,
Vice-president Tolhurst Machine Works, Troy, N. Y.

New York, June 28, 1911.

PUBLICITY FOR PLATERS

Our valuable trade papers have done much to advance the plater by publicity and if the new plater, benefiting by the knowledge he has gained by reading these papers, will write of his experiments and observations instead of hiding them away in the back of his head, as has been the custom, he will be doing himself and the members of his profession untold good and will gain far more than he would under the old régime. The opportunity for the new plater was never so great as it is now that we have an association for the purpose of disseminating knowledge of the profession to the profession. Those who believe in the idea of the new plater should not hesitate to come forward voluntarily and contribute their support to the association.

PERCY S. BROWN.

THE SITUATION REGARDING THE FOUNDRY EXHIBITION AND FOUNDRYMEN'S CONVENTION

To the Editor of THE METAL INDUSTRY:

I have read the comments anent the exhibition question in connection with our conventions with much interest, and from these comments and a consideration of the question as a whole, I would say that the time will soon come when both the Allied Associations and the Exhibition Company, if they wish to co-operate, will have to get together and discuss a definite policy of action. In order that this matter may be better understood, the following facts may be quoted. First, from the standpoint of the Foundrymen's Associations: The desire has always been to visit a different locality from year to year—as widely apart as may be considering the invitations received. This places the burden of entertainment on the foundrymen of a given city but once in a decade or thereabouts. Again, it enables foundrymen of one section of the country to visit the shops of an entirely different and non-competitive locality, and to compare notes on the foundry advance. Finally, it enables the formation of new ties of friendship and business relation, bringing men of all sections more closely together, and advancing the industry and its desired standards by concerted action.

The exhibition factor is a big one, necessarily, educationally and financially. Our members hope to see it continued and enlarged. Educationally it helps the objects of the Allied Association work; in other respects it is a question whether there is any gain. Immense crowds are attracted, it is true, but here are the disadvantages: The meetings are deprived of an attendance which loses itself in the attractions of the exhibit. So far the meeting rooms have suffered from the noise of either the machinery or the registration, to the annoyance of members and presiding officers. Finally, the gain expected from the big crowds, so far as membership is concerned, is nothing whatever. At the big Pittsburg Convention the new members received were about twenty. The additional cost for convention expense to our association, owing to the enlarged functions, etc., was at least double the dues received from these new members. And last of all, some sixty-five members had to be crossed off for non-payment of annual dues—all of these gathered as new members during conventions with the exhibit feature. The interest evidently on the part of these men was not in the association work, and their business courtesy in ignoring statements and letters is another story.

Now let us look at the matter from the standpoint of the exhibitors. It is business with them, first, last and all the time. This is right and proper, and the associations hope that they may do well. The letters you have printed reflect the situation well. Nearly all of the exhibitors want to have the show move about—for business reasons. On the other hand, the growth of the exhibitions, the introduction of a lot of exhibits having nothing whatever to do with the foundry proper, is making the selection of a convention city, so far as the Exhibition Company is concerned, a serious matter. There are but few cities in the whole country in which an exhibition like the Pittsburg one can be placed, and hence sooner or later the scope of the exhibition will have to be limited to the foundry in its strict sense, or else a permanent exhibition city will have to be adopted. Limiting the scope of the exhibition is a matter strictly up to the Exhibition Company, and hence may be dismissed at once here. Selecting a permanent city has its advantages and serious disadvantages also. The history of permanent exhibits in this country, as perhaps elsewhere also, is one of ultimate financial failure. This subject is not flexible enough. People do not want to go to the same place yearly for the exhibit only. Local conditions will ultimately shape the policy of the management, and interest will be lost.

So far as the Exhibition Company is concerned, if the members wish to have a permanent home, it is up to them. So far as the Allied Associations are concerned, if I know the temper of the members individually, the selection of any one foundry centre for a permanent meeting place will not be tolerated for a moment. The selection of a place of general interest, such as Atlantic City, is another matter, and might meet with approval for a few years at least. And this practically only on account of the shifting of the burden of entertainment from local cities to the members themselves. Witness the struggle the American Society of Mechanical Engineers is now having in regard to the annual New York City meetings. The strain of the local entertainment is a constant worry for the committee in charge, and an annoyance to those local members who still dip into their pockets for this purpose. At some such place like Atlantic City, all this would fall away.

The permanency of such an arrangement would, however, be a serious question, for the members of the Allied Associations would entirely lose the opportunity to visit plants—a very important feature of the conventions. The gain to the associations would be nil so far as membership is concerned, and the outcome of several years of such a trial would determine the ultimate disposition of the whole question.

Perhaps another issue might just as well be discussed here: Knowing the feeling of the members of the various associations, I would take it that the selection of the convention city—as things are now—lies altogether with the Allied Associations, and not with the Exhibition Company. Officially, as secretary of the oldest association, the invitations from the various cities have come to this office. Invariably, before promising to bring the invitation to the attention of the convention, I have requested correspondence with the office of the Exhibition Company to assure that body of the capability of the city in question to care for the exhibit. It would seem to be up to the Exhibition Company to promptly look into the claims of the city in question so that the Allied Associations can act with the facts before them, desiring, as they do, to help along the great work with all possible harmony of interests.

Seeing very clearly that the time is rapidly approaching when but very few cities are able to house the growing exhibits, it would appear that we cannot start facing the situation any too early, and if a separation of the meeting dates for associations and exhibitions is to be avoided, some conferences are in order. We have the experience of the society above mentioned to show that difficulties arise when annual meetings for association work proper are held in the same city. On the other hand, we also have the experience of the Master Mechanics' and Master Car Builders' Associations, holding annual meetings in connection with an enormous exhibit, at the same locality. The practical swamping of these meetings by the exhibit in question is notorious, and something our foundrymen might not wish to stand for.

Perhaps through your columns some light may be shed on the subject if you care to devote space to the question. All I can repeat is that in the interest of progress and advancement of foundrymen and supplymen alike, it is necessary to find some modus vivendi in the very near future, otherwise these interests, which ought to be allied together, will rapidly pull apart.

RICHARD MOLDENKE.

Watchung, N. J., June 21, 1911.

CENTRIFUGAL DRYERS

To the Editor of THE METAL INDUSTRY:

The comments of Mr. Alfred Sang, of Paris, France, relative to statements made in connection with centrifugal dryers in my article on "The Use of Sawdust as a Drying Material,"* are not conclusive. Because 5,000 gross of hooks and eyes are dried within three minutes does not disprove my statements in regard to articles with hollows or deep depressions with only one outlet. I fail to see where hooks and eyes have any deep depressions. It is for such articles as these that centrifugal dryers have an advantage over other methods. Take thimbles, for instance, that are nickeled or silvered, they must be washed in water. Does Mr. Sang presume to say the water would be entirely eliminated by the heat mentioned. These are tapered and sometimes fit very nicely in each other, and there are thousands of other articles of a like nature that cannot be dried in such a manner. To try and see if you can expel water by centrifugal force, try the boy's experiment of swinging a pail full of water round and round, the water still stays there by centrifugal force. This is what I have tried to prove in my article.

CHARLES H. PROCTOR.

*THE METAL INDUSTRY, March, 1911.

NICKEL PLATING

To the Editor of The Metal Industry:

"Electro's" criticism* of Mr. Brown reads right enough scientifically, but would the ordinary electroplater be able to follow "Electro"? I am afraid not. What we want is to make articles (written on electro deposition) as plain and simple as possible at present, for I find the ordinary electroplater, although willing to learn, is greatly barred from his lack of education in chemistry. That mainly is his own fault, for here in London there is every opportunity for him to learn. For instance, at the Northampton Polytechnic Institute, Clerkenwell, London, everything that can be done to make the path of the electroplater easy is done: he can learn chemistry suitable to his requirements; he can also be taught to plate scientifically and to depart from the old rule of thumb methods.

There are a few who take advantage of this, but only a few, great is the pity. There is no doubt that many of the employers are responsible for their employees' lack of interest in scientific methods, because of the grudging manner which time off is given to the would-be student. And again there is want of thought for the employees' future needs; truly in this case "sufficient" knowledge, for today is the evil thereof and tomorrow is likely to find it out without any preparation having been made. There are a few firms who can see the need of a proper education in all matters pertaining to their business and who give their employees every opportunity to avail themselves of the benefits to be derived from scientific methods. These are the firms who I have noticed make the most rapid strides and always have plenty of work of the best kind—just because the work can be relied upon—and such firms are financially sounder because of the economy of scientific principles.

S. R. Bonney,
Instructor in Metal Coloring,
Northampton Institute, London.

May 13, 1911.

*The Metal Industry, April, 1911.

POLISHING WHEELS

To the Editor of The Metal Industry:

I have read the article of T. C. Eichstaedt on the "Care, Use and Abuse of Polishing Wheels," which appeared in March number of The Metal Industry. At first I thought it unnecessary that one should write of such ancient polishing wheels (or bobs as they are known here in London). I have been in the trade 32 years and have had considerable experience in polishing, plating, etc., as employee and employer. I have made my own polishing tools and worked them, and also had some nasty smacks from loose leather and split wood, through being too hasty to use the tool after fixing on the leather. I remember that I once cut out a circular disc from a good clean piece of deal, turned it up true, put on the leather, and about 10 hours after put the bob to work roughing out bicycle cranks. I did not do many before I got a smack on the shoulder from the loose leather and before it was possible to say Jack Robinson the wood lay about the shop ready split for firewood. I cannot remember what I said; perhaps, if I did, it would not look well in print, but anyhow it taught me a lesson.

The next attempt at bob making was with elm wood. I took two pieces of 1 inch stock, glued together grain crosswise, and when thoroughly dry and well set (this time I allowed three days) cut out a circular disc 12 inches diameter, turned up true, and with great care glued on the leather, allowed three days for drying, turned the leather up true, glued on the 120 emery, allowed 15 hours to dry, and used this bob for glazing bicycle cranks. The bob lasted me two years before the leather wore too thin; it was a good tool, and ran as true as it was possible for a bob to run; but unfortunately it was left near the window one night during a downpour of rain, got wet and warped. During the time that bob was in use I had made several others, and giving plenty of time in the drying got no further trouble. Although I am in favor of the felt bob there are jobs where the leather covered wood bob does better work, and I am of the opinion that, while we have metal polishers who know what tool to use for the work on hand, the day is far off when the leather covered wood bob will no longer be seen in the polishing shop.

I quite agree that there is a waste of glue and emery, because of hasty use after dressing; there is great economy in having at least three sets of tools to each polisher. A bob is put on the spindle that has been stone dried after dressing apparently dry through; but directly work is placed against it, off flies a bit of emery. You stop and find the bob is full of blisters. The result is loss of time, emery and glue, with the interval filled in with bad words.

I shall look forward with pleasure for further articles from Mr. Eichstaedt.

S. R. Bonney,
Instructor in Metal Coloring, Northampton Institute,
May 13, 1911. London, E. C.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ANNEALING

Q.—Kindly tell us the best way to anneal thin sterling silver, both in the flat sheet and after it is drawn into a cup shape by an ordinary drawing press. We wish to get it dead soft so that it can be easily bent around the flange by hand.

A.—The flat sheets should be run through a slush of boracic acid and water and allowed to dry, after which they may be annealed in a regular gas annealing furnace or over a charcoal fire. Do not let the silver get hotter than a cherry red.

When a quantity of small pieces have to be annealed the quickest way is to put them in an iron basket, dip in the boracic acid slush and let dry. After the pieces are dry they can be annealed in the basket or in a sheet iron pan.

The boracic acid is removed by boiling in clean water.

Silver annealed as above will not require pickling and will contain no fire.—O. A. H.

Q.—We are making a sterling silver spoon with a floral design handle and are having trouble in having the handles roughened in the annealing oven and in the fire-staining dip. We have tried to use fireless silver, but as the spoons must be struck once, then annealed and struck again, they get full of fire just the same. The design is such that it cannot be bobbed or buffed and if we do not fire stain them they look like lead. Can you give us a remedy for this trouble?

A.—The best way out of your trouble is to strike the blanks the first time as usual, then fire stain them and have them thoroughly scratch brushed with a fine, brass, wire wheel until they are clean and quite bright, then rinse in hot water and dry in maple or boxwood sawdust. After the blanks are taken from the sawdust they should be passed under an airblast so as to blow off every trace of sawdust, then struck again for a finish.

If the blanks are properly fire stained and cleaned, and the dies are clean and polished, you will have no difficulty in making a fireless spoon that will be as smooth as if grease buffed. Some firms cover over the fire in their products by silver plating them, but it is a practice that cannot be recommended because, when the fine silver plate wears off in places and the silver that is full of fire becomes exposed, there is such a difference in color that the articles look as if made from base metal, silver plated.—O. A. H.

CASTING

Q.—We have to cast a hot-blast valve seat, cored to run ½ inch metal all around, except on top, which is to be ⅝ inch, with five 1¼-inch pipe holes, out of a composition comprising copper 84 and ferro-manganese 16. Kindly advise as to the best method of pouring this metal and also whether it will run freely enough to get a good casting. Also tell us how to alloy the ferro-manganese with the copper so as to bring good results and make it non-porous. We have been making the same casting with a composition of copper 98 and tin 2 with excellent results.

A.—The copper and tin mixture you mention has a low tensile strength and loses its strength rapidly as the temperature rises, while the copper and manganese alloy is very strong at high temperatures. The copper and manganese alloy is best made by melting the copper and ferro-manganese separately, getting them very hot and then pouring together into a large, preheated ladle, stirring vigorously all the time and finally adding 10 lbs. of zinc and ¼ lb. of aluminum. Pour into ingots and remelt.

Alloys like this one can only be properly made in a Schwartz furnace or crucible steel melting furnace, as they require a high temperature for properly alloying. The mixture recommended above, if properly alloyed, will give 65,000 tensile strength and 25 per cent. elongation.—J. L. J.

CLEANING

Q.—I want a list of the operations solid gold jewelry must be put through to clean it after it has been hard soldered and enameled.

A.—After the jewelry has been enameled the first operation is to pickle it in the ordinary one to six pickle (six parts water and one part oil of vitriol) until the articles assume a uniform light green color, or, if the gold is of a low karat, the articles may have a red color, as if they had been copper plated.

The next operation is to strip off the superficial green coating in a solution that contains per gallon:

Cyanide of Potash	5 ozs.
Carbonate of Potash	1 oz.
Carbonate of Copper	3 ozs.

A very thin copper anode should be used on the negative wire and the articles to be stripped connected to the positive wire.

From 2 to 12 volts can be used, but in using an excessively high voltage great care must be taken not to eat the gold down below the enamel.—O. A. H.

COLORING

Q.—Can you give me a good solution for a blue black on brass?

A.—To produce a good blue black upon brass by immersion there is nothing better than the ammonia copper dip. To prepare this dip dissolve two pounds of dry carbonate of copper in two gallons of strong ammonia; then dissolve in one-half gallon of boiling water one pound of carbonate of soda and mix well together. For a bright black, polish and cleanse the articles in the usual manner; then immerse for a few seconds until the proper color is developed; then remove, wash in clean, cold water and immerse in a used potash solution for a few seconds to set the color. Rewash, dry and lacquer. For antique work the black may be relieved as required.—C. H. P.

DEOXIDIZING

Q.—We are making copper cakes for rolling into sheets, all thicknesses, and we were wondering what you could suggest as being the best metal to add to such copper, when pouring the cakes, in order to increase their ductility and softness, after they have been rolled into sheets.

A.—We would suggest that you could use magnesium as a softener to the copper at the time of pouring into cakes. The magnesium should be used in the ratio of two ounces per hundred pounds of metal. If the copper is properly poled and deoxidized we fail to see why it should be necessary to add anything to it as pure copper is one of the softest and most malleable of metals in itself.—K.

FINISHING

Q.—I wish to match casket hardware of the following finishes: dark bronze, blue black oxidize, mahogany. Any information that you can give me will be appreciated.

A.—The finishes you mention can all be produced with a solution of sulphuret of potassium. Of course it will be necessary to copper plate the articles previously. The dark bronze finish should have a copper plate, then immerse in a solution consisting of one-half ounce of sulphuret of potassium in one gallon of cold water. Immerse until a very dark brown is produced, then remove, wash, dry, and scratch brush the surface, using a soft brass wire scratch brush, and finally lacquer. This will give you the dark bronze.

The oxidized finish is produced in the same manner, but immerse until black, then wash, dry and develop the blue black by scratch brushing.

For mahogany use only about one-quarter ounce of sulphuret to the gallon of water, copper plate, scratch brush and cleanse as in the previous operations. Then immerse for a couple of seconds, wash and dry. Scratch brush the articles as before mentioned; this operation will produce a light bronze tone. Now immerse the articles in the dip again and repeat the brushing, this should give you the mahogany tone. A little experimenting on the lines given will give you the desired results.—C. H. P.

GOLD DEPOSITING

Q.—Can you give us a good 14-k solution; one that has a clear, red color, almost coppery? The solution I am now using yields a deposit that looks milky if we plate heavy enough to stand acid. Can a deposit that will stand acid be obtained that will look clear without dry buffing?

A.—A 14-k solution to yield a good, clear deposit that will stand acid should contain per gallon:

Cyanide of Potassium	6 ozs.
Phosphate of Soda	3 ozs.
14-k Gold	30 dwts.

The cyanide and phosphate of soda should be dissolved in boiling, hot water and the gold run off from an anode by the porous cup process. The anode should consist of:

Fine Gold	14 parts.
Copper	9 parts.
Nickel	1 part.

If, after working awhile, the shade is too red, the solution can be toned with carbonate of nickel and fine gold. Sometimes the solution is blamed for yielding a smoky-looking deposit, when, as a matter of fact, the articles are tarnished during the washing and cleaning before being immersed in the solution.

If the articles are washed in a fairly strong soap and ammonia wash, rinsed in cold water, then dipped for a few seconds in a "Kalye" solution, made by dissolving two pounds of Kalye in three gallons of boiling water, then rinsed in cold water and colored, the deposit will be clear and snappy.—O. A. H.

OXIDIZING

Q.—We enclose a cut of one of the articles we make. The frame around the glass lid we have heretofore made of nickeline or nickel plated tin. We find that neither of these are satisfactory for our use, because they tarnish too easily, especially where exposed to the atmosphere outdoors. Can you suggest any metal or composition that would be better for our purpose than we have been using?

A.—It appears to us that nickel zinc would be far better to use than nickel tin because the nickel zinc would not rust in the manner of nickel tin. Nickel tin is made from tinned sheet iron, nickel plated. In using this material for stamping or press work the uncovered edges become exposed and form an iron rust, especially when exposed to atmospheric

influences. Zinc oxidizes slightly, but cannot rust like iron. You may experience a little more difficulty in soldering zinc with the usual chloride of zinc soldering fluid. In this event use a mixture of three parts glycerine and one part of muriatic acid or less if results can be obtained.—C. H. P.

PLATING

Q.—Will you tell me through your paper what amperage and voltage should be used for a brass and bronze solution?

A.—The voltage for brass or bronze solutions should not be less than 4, 5 or 6 volts. The amperage will depend upon your cathode surface. If your dynamo is of sufficient ampere capacity the voltage will readily take off the amperage when using a rheostat.—C. H. P.

Q.—Will you please tell me what to do to make my nickel tank plate white? I would also like to have a formula for making a good black finish on brass?

A.—If your nickel solution contains sufficient metal then your trouble is probably due to poor conductivity of the solution. Add 2 ounces of sal ammoniac to each gallon of solution, this will give you a better conductivity solution and a whiter deposit. Occasionally add 1 ounce of single sulphate of nickel to each gallon of solution, this will maintain it with the correct amount of metal.

Unfortunately all black oxidize deposits have poor wearing qualities. We give you the following which produces a good hard deposit and should have good wearing qualities. Heat muriatic acid in an earthen-ware pot, then add 2 pounds of powdered white arsenic to each gallon of acid, while the acid is still hot add 4 ounces of single sulphate of nickel and ½ ounce of sulphate of copper to each gallon. When the solution is cold it is ready for use. Use nickel anodes and a weak current. Do not carry any more water in the solution than you can help. Water causes a muddy black. The articles must be perfectly clean, owing to the large excess of acid used. It is advisable to coat the articles for a few minutes in a regular nickel solution before plating in the black solution. The surface should afterwards be lacquered.—C. H. P.

POLISHING

Q.—I am using a steel ball machine for polishing before and after plating, and am having trouble after plating, the balls seem to beat the nickel off. The work appears to be clean before plating with a good bright color. I am using 200 pounds of steel balls with castile soap. Perhaps my nickel is not right or am I not using the right kind of preparation with the balls?

A.—Your nickel appears to be a good color but is probably too brittle. Soften the deposit by adding one or two ounces of sal ammoniac to each gallon of solution. If your deposit is the fault of the solution, this will probably overcome your trouble. If the trouble is due to imperfect cleaning we would advise you to tumble the articles (after cleaning in the regular way) for a few minutes in a dilute solution of hydrofluoric acid and water. This will give you a better clinging surface for your deposit. Try the above method before making the addition as prescribed above to your solution.—C. H. P.

REDUCING

Q.—How can we do metallizing on non-metallic substances or organic substances by a pouring or dipping process; also, please give us a good reducing agent for silver in solution form?

A.—There is no known process for metallizing organic or non-metallic substances by a pouring or dipping process.

The easiest way to reduce the silver solution and recover the silver is to dilute the solution until it stands at about 3 degs. Be., then add muriatic acid until all the silver is thrown down as a chloride. After the old solution has been poured off and the chloride dried, it may be melted in an ordinary crucible, using 5 pounds of carbonate of soda for every 2 pounds of silver chloride.

When adding an acid to a cyanide solution, it must be borne in mind that the fumes given off are deadly poison and must not be inhaled to the slightest extent. If a person has not the proper means of taking care of the fumes it is better to send the old solutions to a refiner rather than to try to do the job himself.—O. A. H.

REFINING

Q.—We are having trouble with iron ladles used for ladling refined copper ingots. The ladles do not wear out, but simply split after ladling about two tons of copper. We use a fire-clay slurry for washing the ladles. Will you kindly inform us what is the best wash to use on iron ladles used for this purpose?

A.—The ladles for molten copper should be made from well worked, double refined Swedish iron, and should be washed with a slurry of high grade kaolin. A skillful ladler will avoid "washing off" his ladle in the molten copper as much as possible, and in this way increase the life of the ladle.—J. L. J.

SOLDERING

Q.—Kindly give me a formula for the solution used for soft soldering wit ha blowpipe and also what is the best solder for the same purpose?

A.—A solder consisting of tin 50, lead 50 is generally considered the best all-around formula for a soft solder. Alcohol saturated with chloride of zinc is an excellent flux.—J. L. J.

SILVERING

Q.—Will you please publish in your journal a good method to silverplate knives?

A.—The methods used by one of the most prominent silver-plated steel knife concerns in the United States is as follows:

First—Boil out the knives in a hot potash solution, then wash and immerse in undiluted muriatic acid, rewash them and place in a solution consisting of two ounces of carbonate of soda to each gallon of water. This solution is to prevent rusting of the steel.

Second—The knives are scoured from this solution, using powdered pumic stone mixed with water and a tampico scouring brush run at about 500 revolutions per minute. After scouring place the knives in soda water until ready for plating.

Third—Wire up the articles (or in quantities use frames for the purpose), then pass through a hot potash for a second or two, wash in cold water, then immerse in a 10 per cent. solution of muriatic acid, and then a 5 per cent. from one to the other, and rewash. To neutralize the acid the knives are passed through a clean cold potash solution standing about 10 deg. Baume. This cold potash is maintained exclusively for this purpose of neutralizing the acid and should not be contaminated with anything else.

Fourth—From the cold potash the knives or forks are drained well and immersed for a few seconds in the first striking bath. This bath should consist of eight ounces cyanide to each gallon of water. Use the solution cold. The anodes should be quite small and consist of copper. A small silver anode should be used at the same time; no deposit will be noted.

Fifth—From the first strike place the articles in a second striking bath. This should consist of one-half ounce silver chloride and four to six ounces of cyanide in each gallon of water. The anodes may consist of silver with small anodes of copper, just the reverse of the first strike.

Sixth—From the second strike the articles are placed in the regular plating bath. Care should be taken that the solution should not contain too much free cyanide or be too rich in metal. A solution containing three to four ounces of chloride of silver and seven to ten ounces of cyanide per gallon gives good results. Cyanide of silver is preferred by many silver platers, especially in plating steel knives and forks, but this is a matter of opinion. Some platers obtain just as good results with silver chloride. Sometimes a third strike is used in connection with the above methods and usually contains about twice as much silver as the second strike and about half the amount of cyanide.

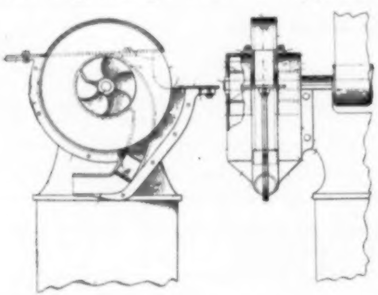
These methods overcome the faulty deposits that so many concerns have experienced in trying to produce succesful results upon steel knives.—C. H. P.

PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

992,489. May 16, 1911. GRINDING MACHINE. L. F. Fales, Walpole, Mass.

This is an invention covering a casing for a grinding wheel. Other objects of the invention are to provide a grinding machine or apparatus of such a character that the grinding wheel is so covered that the operative is protected from injury by the bursting of the wheel or by the throwing outward of particles or pieces of the wheel. Another object of the invention is to so construct a grinding machine or apparatus having a rotatable shaft for the grinding wheel that a fan or fans mounted on said shaft may induce currents of air from the point of grinding. The invention also consists in the novel means for inducing currents of air through said casing. The invention also consists in such other novel features of construction and combination of parts as shown by the machine in the cut.



992,600. May 16, 1911. PROCESS OF TREATING ALUMINUM ARTICLES FOR THE FORMATION OF GALVANIC METAL COATINGS. Carl Rümpler, Schöneberg, near Berlin, Germany.

The present invention relates to an improved process of forming galvanic metallic coatings on aluminum and consists in preliminarily freeing the aluminum article to be treated from grease or the like, cleaning it and then providing it in a preliminary bath with a thin film-like coating upon which any desired metallic coating may be deposited in the usual electrolytic baths employed for ordinary metals. The essential feature of the present invention may be said to consist in the fact that the film-like deposit, which forms the basis for the actual metallic coating to be subsequently deposited, consists of a metallic alloy.

It has been found that by employing a metallic alloy an extremely adherent coating is obtained upon which any other desired metal can be deposited directly. The most suitable metallic alloy for the deposit is brass obtained from a bath containing a suitable copper and zinc salt. A bath consisting of double cyanide of copper and zinc is specially suited for forming this deposit, an adequate quantity of sulphite being added to the bath in order to prevent oxidation of the cyanide. It is also advantageous to add to the bath a small quantity of a salt having an alkaline reaction such for example as potash or soda. This solution, however, deposits a brass very rich in zinc and a coating of this is less adherent than if the alloy is poorer in zinc. The precipitated alloy should preferably contain not less than 50 per cent. of copper. Now it has been found that in order to obtain a deposit containing a sufficient percentage of copper it is necessary to add a small quantity of an alkaline haloid such for example as chloride of potassium or iodide of potassium.

Good results are obtained with a preliminary bath of the following composition; 1 liter of water, 40-60 gr. of double cyanide of copper, 15-30 gr. of double cyanide of zinc, 40-80 gr. of commercial sodium sulphite, 10-25 gr. potash, 2-10 gr. of chloride of potassium. For the double cyanides it is advantageous to employ the respective metallic salts with cyanide of potassium solution until the cyanide deposit formed is dissolved.

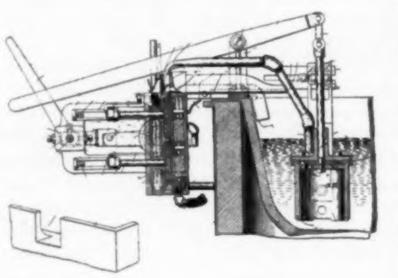
The anodes may be of brass or of copper and zinc anodes, or only copper anodes can be used, in which latter case, however, it is frequently necessary to regenerate the bath and replenish the double zinc cyanide. If the brass is to adhere well, in the first place it is essential to maintain a suitable voltage. The voltage depends upon the halogen ion employed. It must be highest when chloride is present, say approximately 1.8 volts; bromide requires approximately 1.8 volts; iodide approximately 1.6 volts. It is advisable to have a current strength of from 2 to 3.6 amperes per square decimeter. The period for the formation of the thin film-like coating of metallic alloy on the aluminum may amount to from one-half a minute to two minutes. Preferably the article is only exposed to the current in the electrolyte for a period of substantially one minute.

992,853. May 23, 1911. INGOT CASTING MACHINE. G. M. Clark, Jr., Lynn, Mass.

The invention relates to ingot-casting machines as shown in cut, whereby molten metal may be cast into ingots of suitable size for use in melting pots of linotype and monotype machines.

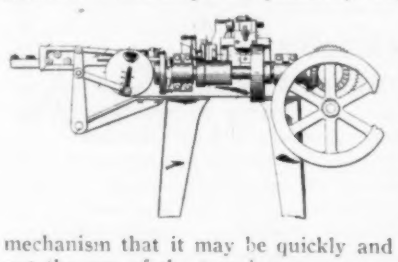
The object of the present invention is to effect certain improvements over the ingot-casting machine described in Letters Patent No. 946,721, dated January 18, 1910, whereby several difficulties arising from the practical operation of said machine may be overcome.

The patent covers the following claim: In an ingot-casting machine, a mold comprising two relatively movable mold members, the movable mold member having an upwardly extending throat member open at the top and front and communicating with the mold, said throat member cooperating, when the mold is closed, with the upwardly extending edge of the stationary mold member to form the throat of the mold, a molten-metal-conveying pipe terminating in said throat and an apron secured to the stationary mold member for conveying the overflow from the mold back to the melting pot, the throat being provided with a passage way to the apron, and the passage way being tapered outwardly toward said apron.



992,890. May 23, 1911. METAL-FORMING MACHINE. A. J. Lewis, Watertown, Conn., assignor to The Baird Machine Company, Oakville, Conn.

It is the object of the invention, among other things, to provide a new and improved feed for such a machine as shown in cut that will operate with greater speed and less power than such mechanisms now in common use; have but few adjustable parts that are simple in structure and operation and arranged so as to be convenient of access; non-friction gripping members that are operated independently by the feed slide; and adjustable pin mechanism to prevent overthrow of the feed members; means for instantly and positively stopping the feeding of the metal; a graduated adjustment of the feed that will insure the accurate feeding of metal of predetermined lengths; means for rigidly holding the metal during the return of the feed slide; to so design and arrange the cut off mechanism that it may be quickly and accurately adjusted without the use of the tamping means common at the present time; to provide a metal clamping or binding device that may be operated from fixed cam means; and to apply a swinging form holder so mounted as to be interchangeable with a fixed form holder; and to accomplish these and other desirable objects with mechanism that is simple in design, may be constructed and assembled economically, and will operate at the highest speed and with the maximum efficiency.



993,042. May 23, 1911. NICKEL ALLOY FOR HIGH RESISTANCES. Wilbur B. Driver, East Orange, N. J.

This invention relates to alloys intended especially for electrical resistances. The object of the invention is to produce workable alloys which will have high electrical resistances, with high melting points, and that will not deteriorate to any noticeable extent upon exposure to the atmosphere.

Various alloys have been known and used for electrical resistance, having more or less high electrical resistance, but as a rule the melting points of these alloys are comparatively low, and many of them are not stable in their electrical properties and besides are liable to deteriorate from rust, etc.

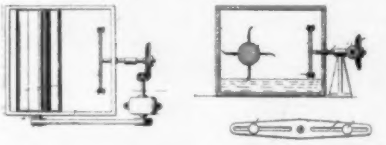
Nickel is malleable, has a high melting point, is practically non-corrosive, and is reasonably cheap. The alloys composed of nickel and manganese alone (disregarding any other substances that may be present as impurities) have quite a high electrical resistance, but one purpose of this invention is to increase the resistance of such alloys still further. In general also, by increasing the percentage of manganese in the alloy, the electrical resistance is increased; but there is a limit to the percentage of manganese that may be employed, because too much manganese will render the alloy unworkable. On the other hand, any increase of the percentage of nickel is the same as decreasing the percentage of manganese, and the resistance is thereby reduced.

Although copper, for instance, has a far lower specific electrical resistance than nickel and manganese, yet if a small proportion of copper—one per cent. or more—be added to the nickel and manganese, the resulting alloy has a higher electrical resistance than the alloy composed of nickel and manganese alone. For example, an alloy of 90 parts nickel and 10 parts manganese gives a specific resistance of about 36; if 10 parts of the nickel be displaced by 10 parts of copper, making an alloy of 80 parts nickel, 10 parts copper, and 10 parts manganese, a specific resistance of about 53 is obtained; where 20 parts of nickel are displaced by the same amount of copper, the resulting composition consisting of 70 parts nickel, 20 parts copper and 10 parts manganese, has a specific resistance of about 60. Again, whereas a composition composed of 80 parts nickel and 20 parts manganese gives a specific resistance of about 65; it has been found that the substitution of 10 parts of nickel by the same amount of copper, producing the alloy 70 parts nickel, 10 parts copper, and 20 parts manganese, gives a resistance of about 80; and an alloy consisting of 60 parts nickel, 20 parts copper, and 20 parts manganese, gives a resistance of about 90.

993,503. May 30, 1911. ETCHING-MACHINE. C. P. Browning, Brooklyn, N. Y.

This invention relates especially to etching machines, as shown in cut, for the use of photo-engravers, and has for its object the provision of a machine which will effectually prevent undercutting, or the production of a shoulder on one side of the raised surface, producing a plate having clean-cut, even lines.

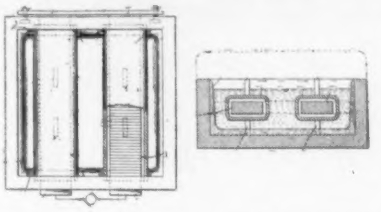
In use, the plate to be etched is secured in place upon the holder the acid within the receptacle being located below any point where the plate to be etched can reach it. When movement is imparted to the mechanism the acid is thrown by the blades against the plate, flowing down the surface thereof, and at



the same time the plate is slowly revolved, thus insuring a uniform action of the acid upon all parts thereof, preventing any possibility of undercutting or the formation of a shoulder on one side of the raised surfaces of the completed plate, as would be the case if the plate, or any part of it remained at rest and the acid be applied continuously to one spot, thus producing an evenly etched plate, this invention being an improvement upon the etching apparatus shown and described in Letters Patent No. 721,445, issued February 24, 1903, to John A. Holmstrom.

994,217. June 6, 1911. ELECTRIC FURNACE. John Thomson, New York, assignor to Frubert Process Company, New York.

This furnace as shown in cut is an improvement in electric furnaces of the type in which heat is generated by passing the current through a resistor ordinarily formed of carbon. The general object of the improvements is to provide a furnace of this type in which the thermal loss due to radiation shall be as little as possible; and in accordance with the improvements the resistor is arranged so as to be either partially or wholly immersed in the bath. In order that the resistor may be electrified, while thus partially or wholly surrounded by the ma-

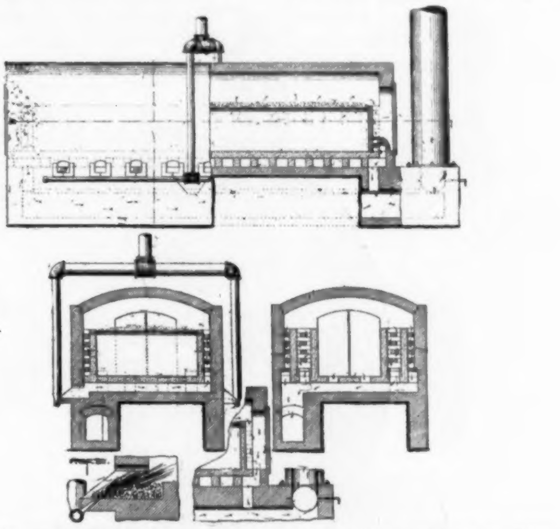


terial to be heated, a casing or shield is provided to envelop the resistor and thus prevent the bath from coming in contact with it. By this means, too, the resistor is protected from the effects of the oxygen and other active constituents of the gases of the melting chamber, this in fact being another object which the invention is designed to effect.

995,460. June 20, 1911. ANNEALING FURNACE. E. H. Holmes, Beaver, Pa.

This patent covers an annealing furnace as shown in cut. The principal claim is:

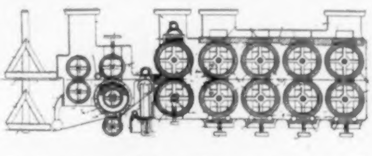
1. In an annealing furnace, the combination with an annealing-chamber, of a series of combustion-chambers arranged



in one side-wall of the furnace, flues extending under the floor of the annealing-chamber and in communication with the combustion-chambers, a series of combustion-chambers arranged in the opposite side-wall of the furnace and alternating with the first mentioned combustion-chambers, a chamber between the top of the annealing chamber and the roof of the furnace, side-flues, front and rear end flues, a stack at one end of the furnace, and a conduit in communication with the front and rear flues and with the stack.

995,589. June 20, 1911. MACHINE FOR SOLDERING METAL PLATES. Henry P. A. A. Eichmann, Corona, N. Y.

The invention relates to an automatic machine for soldering sheet copper or bronze on sheet steel. The object is to provide superior mechanism, shown in cut, for producing such a product in the form of finished sheets especially adapted to be manufactured into fire-proof and rust-proof doors, window casings, etc., which by reason of the copper exterior will possess all the external attractiveness of solid bronze, and by reason of the steel interior, will also possess the strength



of that material. The patent specification contains the following claim: In a machine for soldering metal sheets and the like, the combination with suitable feeding and cooling rolls, of an acid-supplying roll positioned to revolve between a pair of ingoing sheets, a soldering tank also disposed between the sheets, heating devices for the soldering tank, an additional acid supplying device, a pair of soldering rolls, and a tin supply tank in which one of the soldering rolls revolve.

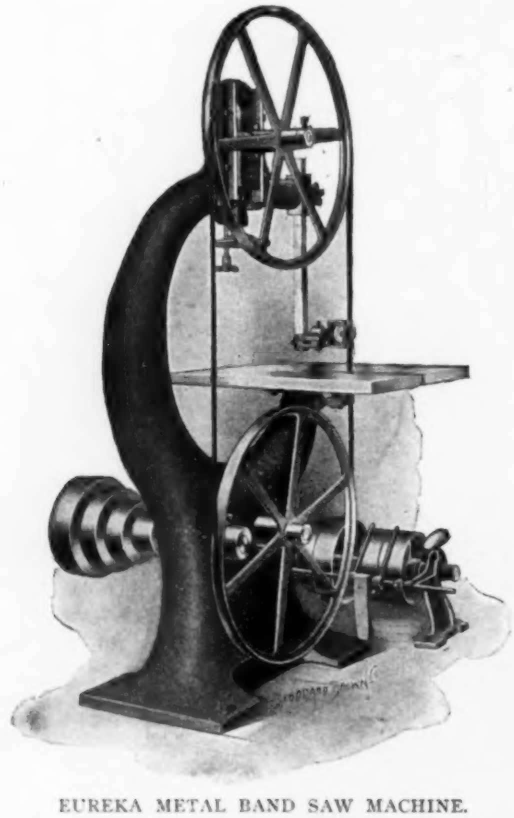
INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

METAL BAND SAWS FOR CUTTING ALUMINUM, BRASS AND COPPER

The Eureka Metal Band Saw illustrated here has been installed in several hundred brass foundries where, it is claimed, it is more efficient and economical than any other machine or device for cutting off the sprues or gates from brass, bronze, aluminum and composition castings. It is also used extensively in mills and factories for cutting tubes, rods, bars, etc.; in die and metal pattern making, scroll sawing and for many similar purposes.

The Eureka machine was designed expressly for cutting metal, but is operated in the same manner as a band saw for cutting wood. It is made in several styles. Number 1 (shown in cut) has an iron table 30 inches square, with holes drilled in it, enabling users to attach a stand and vise having automatic



EUREKA METAL BAND SAW MACHINE.

gravity feed, so that stock can be sawed without giving it personal attention, the feed being stopped when cut is finished.

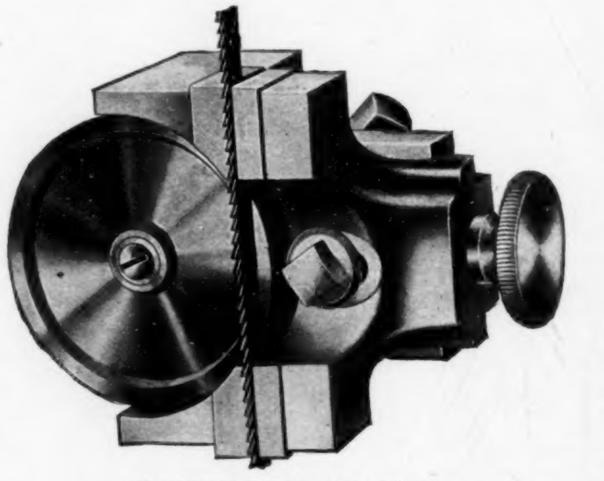
The machines are substantially constructed. The saw wheels are 30 inches in diameter and are driven by a 4-cone pulley, using a 3-inch belt and are geared back 4 to 1. They are made of cast iron, without rubber, felt, etc., on the face, which allows the use of oil for lubrication of the saw, if desired. The top wheel has a lateral adjustment, providing for the proper alignment with the lower one, the position of which is stationary.

The gears are machine cut, and are placed in the hollow of the frame, which protects them from injury by dust and chips. Two of Wright's Band Saw Guides, illustrated herewith, are used, one above and one below the table. The guide bar can be raised so that work 10 inches in height can be cut. The distance between the saw and the frame is 28 inches, which allows a large space for the convenient handling of work. The countershaft has tight and loose pulleys, 8 inches diameter by 3½ inches face; and, for cutting tool steel, machinery steel and hard bronze, should make 120 revolutions per minute; for brass or other soft metals, 240 revolutions.

Style Number 5 is similar to Numbers 1 and 2 except that it is fitted for one speed only. It should be used only where the hardness of the metal to be cut does not vary to any great extent, such as in brass foundries producing only one kind of metal, metal cornice factories, metal pattern shops, etc.

Every Eureka band saw machine is equipped with two of Wright's patent anti-friction saw guides, one above and one beneath the table. These guides and the proper adjustment of same have much to do with the correct operation and efficiency of the machines. By referring to the cut it will be seen the guide provides, by means of a disc, practically frictionless support for the saw. When pressure is put on the saw, instead of being seriously deflected from the vertical, the disc keeps it in line, and as the disc revolves at the same speed as the saw moves, the amount of friction generated is very small.

The successful operation of band saws in cutting metals depends largely on running the saw at the proper speed. Hard, tough metals require different speeds to soft metals. The kind of saw used, the size and numbers of the teeth and numerous other factors enter into the problem. For this reason a shop that expects to use a saw on more than one kind of metal should install the Number 1 machine, which permits variations in speed; and expert advice should be secured (and will be freely given by the manufacturers) on the kind of saw best adapted for any particular class of work. Eureka saws have been on the market for a number of years, and are in successful operation in many of the leading brass foundries throughout the country. Some of the claims made for them are: Large castings as well as small work can be cut far more rapidly and economically than by any other method; work can be cut



WRIGHT'S BAND SAW GUIDE.

so closely that the use of files or wheels is in many cases unnecessary; they will cut work that cannot be reached with a circular saw, and on thin and delicate castings will not bend the work, as is often the case when cutting presses are used.

The saws are made on the "flexible back" principle, being hardened only to the base of the teeth, the back remaining soft to insure them against cracking or breaking while in operation; the teeth have the necessary set to give the proper clearance. They need no filing, but will cut until worn dull, when they can be thrown away and replaced with new ones, at a very small cost. The new saws will do much more work than a saw that

can be filed, and the cost of a new saw is very little more than the expense of filing and setting an old one.

The teeth are finely cut, varying from ten to thirty points to the inch, thereby insuring the greatest amount of cutting surface on a given length. They are especially tempered to give the best possible service on the metal required to be cut.

They are inexpensive; users buying their saws by the coil and doing their own brazing can reduce the cost of a fifteen-foot saw to about seventy-five cents, plus the time of brazing.

They can be used on any band saw machine where the speed is properly proportioned to the work.

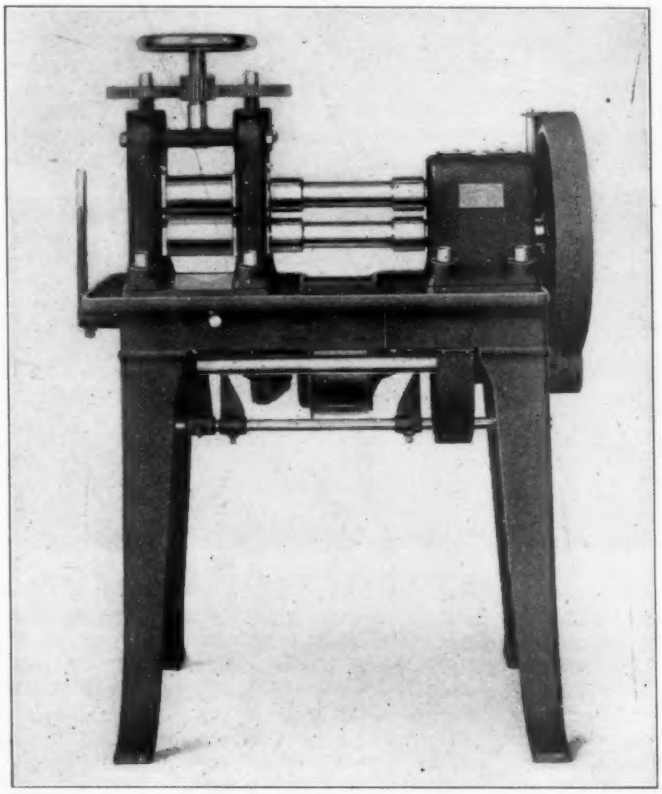
When metal of a uniform degree of hardness is to be cut, Number 5 single speed machine is recommended, which is constructed to meet all the necessary requirements, iron table, Wright Patent Non-Friction Guides, etc.

When metals of different degrees of hardness are to be cut, the Number 1 machine is recommended; this machine is geared back 1 to 4, has a 4-cone pulley with speeds varying from 102 to 1,000 feet per minute of the saw, which will cover any kind of metal that requires sawing.

The Number 1 Eureka Band Saw Machine is sold at $125.00 net; Number 2 (same as Number 1 with vise, automatic feed, stand, etc.), $140.00 net; Number 5, single speed, $100.00 net. All f. o. b. cars, New Haven, Conn. The Henry G. Thompson & Son Company, 496 State street, New Haven, Conn., manufacture the band saw machines described above; also a complete line of hand and power hack saws for all purposes, special band saws for cutting copper and aluminum, saw brazing fixtures, jig saws for metal scroll work, as well as a complete line of tool holders for lathes, shapers, etc.

ONE BELT REVERSING MILL

The mill shown in cut is especially adapted for use when the stock is to be reduced in thickness at one or both ends, leaving the remainder of the piece its original size. Only one drive



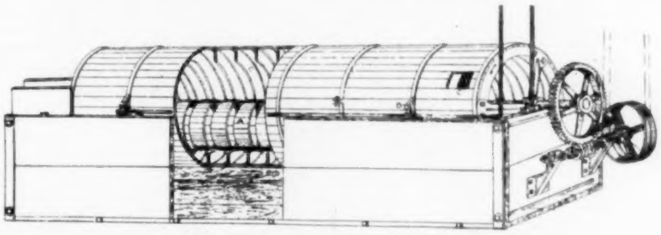
ONE BELT REVERSING MILL.

belt is employed to operate both the forward and reverse action of rolls which is an entirely new feature in rolling mills of the reversing type. The control of the mill is very simple being accomplished by means of a lever, conveniently located at left end of mill. When the lever is in a vertical position the mill is at rest; when moved to the rear the mill is started and after the stock has passed the desired distance through the rolls, the lever is moved to the opposite side which reverses the direction of rotation of rolls thus returning the stock to the operator.

In designing this mill the makers have endeavored to make it as powerful, compact and serviceable as possible. Liberal sized bearings are employed throughout and all bearings have excellent provision for proper oiling. The rolls are 3 inches diameter by 5 inches face with hardened journals and run in bronze boxes. It is double back geared with ratio 1 to 20. The roll pinions are spiral cut and are connected through toggles to the rolls. The bed has a pan top upon which can be laid pieces of stock, gages, etc. The roll adjustment is positive and has a micrometer reading. All gears are protected with substantial coverings. The approximate net weight of mill is about 800 pounds. This mill is manufactured by the Buffalo Machine Manufacturing Company, manufacturers of jeweler machinery, tools and supplies, Buffalo, N. Y., who will gladly furnish additional information.

CONTINUOUS MECHANICAL PLATER

For plating stove trimmings, small hardware, screws, bolts, pipe fittings and all small work in quantities, the continuous mechanical plating barrel shown above is claimed to be about as efficient and economical as a device can be. The work is fed into one end, is carried slowly through the barrel by spiral ribs, and is discharged on a conveyor at the other end. There are three separate cathode rings outside the barrel which may be used for different current densities if desired. Inside the barrel cathode



THE CONTINUOUS MECHANICAL PLATER.

strips are placed between all the ribs. The anodes are in ring form and hang on the central bearing shaft. In this barrel the solution is continually circuiting and renewed from the tank.

The continuous mechanical plating barrel is made to order in any capacity from 400 pounds to 6 tons per ten hours. A three step cone pulley attached to the worm shaft gives speeds that give a 10-, 20- or 30-minute plate as desired. Prices range from $350 for the smallest size up to several thousand dollars for the six-ton machine. The continuous plating machine used in connection with steel ball burnishing barrels makes a complete finishing plant that is claimed by the makers to do away with a great deal of unnecessary labor. These platers are manufactured by The Globe Machine and Stamping Company, Cleveland, Ohio.

URANIUMITE

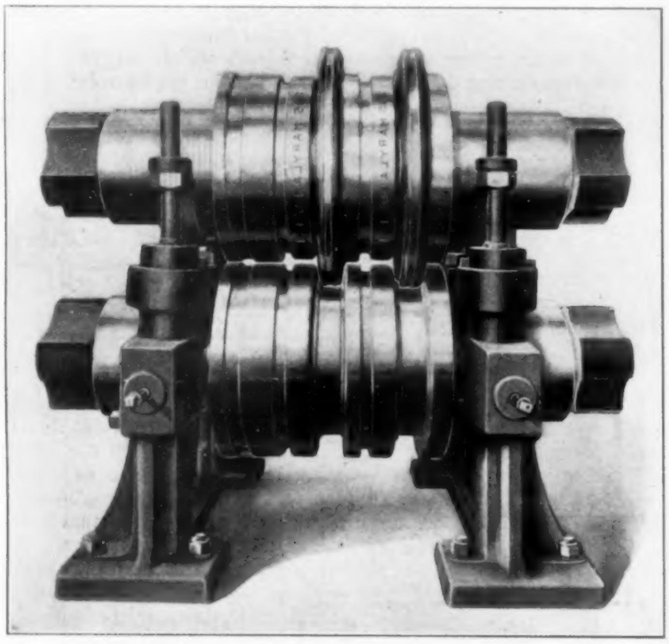
Uraniumite is a new flux or scavenger which is being used in the melting of metals to produce sound castings, and it is claimed that, while it has been on the market only a comparatively short time, it has been used as a secret process for more than twelve years in the manufacture of metals. Uraniumite is manufactured by the Uraniumite Company, Buffalo, N. Y., which has just recently reorganized with the following officers: B. L. Filkins, president; H. D. Zimmerman, vice-president; N. V. V. Franchot, secretary; H. C. Mather, treasurer. The directors are: B. L. Filkins, N. V. V. Franchot, H. C. Mather, H. E. Nichols and Dr. W. L. Bechtold.

This company issues a folder which gives the following directions for the use of uraniumite: It should be mixed in with the charge before melting. It acts as a scavenger and assimilator, promotes fluidity and lessens shrinkage. Its use permits entire charges of scrap and precipitates practically all the metal from the dross. Uraniumite also increases density, solidity and strength in castings, eliminating porousness and lessening loss from blow holes. It will not interfere with any combination of metals or change the chemical contents, and effects an enormous saving of labor in the machining of castings.

CHILLED ROLLS WITH CAST IN PASSES

A new method for making chilled rolls with the passes cast in has lately been patented by Alfred T. Crook and assigned to the Philadelphia Roll and Machine Company, Philadelphia, Pa. The cut shows a roll made by this method. For the benefit of those not familiar with the situation, it can be stated that practically all the chilled-pass rolls made previously have either been made by inserting a chill-ring within an ordinary sand mold or in chill molds split or parted vertically to permit their removal from the roll after cooling. The objectionable feature of the first of these methods is the difficulty in obtaining sufficient chill in the passes. This is due partly to the tendency to use light chill-rings and partly to the fact that the ring is surrounded by sand which is a very poor conductor of heat, and thus destroys the desired chilling effect.

The second method is very economical, but the objectionable features are more pronounced, the first being the tendency of a roll cast in split or parted chills to develop a crack longitudinally conforming with the joint of the chill. This is a very common occurrence, although the crack may not show or develop until the roll has been in service. Another objection to the use of the ordinary divided chill is that the passes being part of the main



CHILLED ROLLS WITH CAST IN PASSES.

body of the chill, cannot change their position to conform with the contraction of the roll after casting. Internal strains are thus produced which are frequently sufficient to cause cracking and even breakage of the roll.

All these objectionable features have been avoided in this patent method of the Philadelphia Roll and Machine Company, in which chill-rings of suitable shape and composition are fitted and temporarily secured within a solid outside shell of such form as can be easily removed intact from the roll after cooling. These rings, which form the passes, are released shortly after the roll is poured and are thus free to change their position within the shell, thereby avoiding all undue resistance to the natural contraction of the cooling metal within. This prevents all internal stresses due to the casting of an irregular body within an unyielding mold, which are largely responsible for the weakness and breakage of a great percentage of the rolls made by the old method.

It will readily be seen that the use of a solid chill also entirely eliminates the possibilities of longitudinal cracks in the roll, which almost invariably occur at the joint of the chill, and which have been a source of annoyance and loss to users of this class of rolls. It will also be apparent that on account of the chill-rings being uniformly in contact with the solid chill shell, which is sufficiently heavy and which is an excellent conductor of heat, it is possible to obtain the desired amount of chill upon the passes of the rolls, which is an especially desirable feature seldom obtained by the old methods, for reasons previously stated.

STELLITE

Stellite is a new alloy or combination of two of the semi-rare metals. While it contains none of the common metals, such as copper, zinc, tin, lead, nickel, aluminum or bismuth, yet it can be made as hard as tempered steel, and is claimed by the manufacturer not to be steel as it contains no iron. It can, however, be made so hard that it will take a keen edge, and razor blades have been made of it with which shaving can be done as

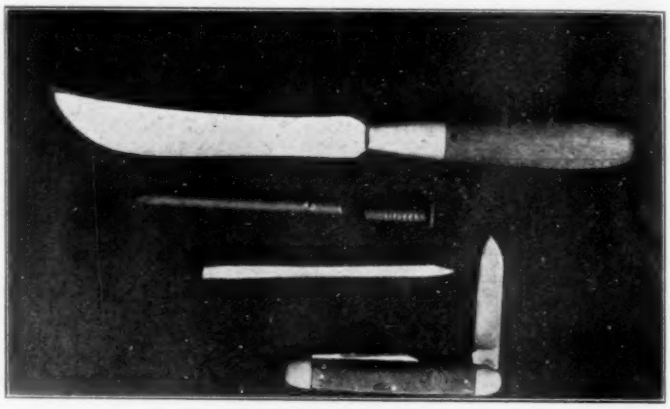


FIG. 1. ARTICLES MADE OF STELLITE.

easily as with a steel razor. The metal also takes a very high polish which it holds under all atmospheric conditions.

The accompanying illustration shows a pocket knife with Stellite blades; a Stellite cold chisel; and a nail that has been severed by it. The knife remains bright after more than two years of service. Fig. 2 shows steel shavings which were removed by a Stellite tool at a speed of 200 feet per minute.

It is claimed that polished knife blades made of this metal can be used for cutting fruits and vegetables of all kinds, such as oranges, apples, lemons, tomatoes, potatoes, etc., without affect-

FIG. 2. STEEL CHIPS TAKEN OFF WITH STELLITE TOOL.

ing its lustre in the slightest degree; neither will it become discolored afterwards.

In color the polished metal stands between silver and steel and presents a particularly pleasing appearance to the eye. Some of the physical properties of this metal are as follows: When a cast or forged bar of metal is suspended by a thread and struck with a hammer, it emits a clear musical ring. A forged bar of Stellite has an elastic limit of 85,000 pounds, tensile strength 110,000 pounds, elongation 9 per cent., and modulus of elasticity 30,000,000 pounds. It will be seen from the above that the metal is somewhat stiffer than steel, and that notwithstanding its great hardness, it still shows considerable elongation.

Further information regarding Stellite may be obtained by addressing Ellwood Haynes, 305 N. Washington street, Kokomo, Indiana.

ITEMS OF INTEREST TO THE INDIVIDUAL.

ELLWOOD IVINS

ELLWOOD IVINS.

Ellwood Ivins, the subject of this sketch and the proprietor of the Ellwood Ivins Tube Works, Oak Lane Station, Philadelphia, Pa., was one of the very first in the production of seamless brass and copper tubing of small diameters in the world, and was the very first man to produce a seamless aluminum tube. He was also the first in the production of cold drawn seamless steel tubing of any diameter, and his mills are today the only works in the world producing a seamless crucible steel tube. Mr. Ivins was born in Philadelphia of American-born parents and his earlier education included a course at an art academy from which he emerged as an artist of some note. While still a boy Mr. Ivins entered into the manufacture of seamless tubes. His first attempts were experiments in the art of making seamless brass and copper tubing in a little room over a grocery store, and here it was that he laid the foundation for the large plant now under his direction, covering two acres of ground.

One notable achievement of Ellwood Ivins as shown in the product of his mills is a seamless brass and copper tube made with a tapering gauge. For instance, the tube is made one and one-half inches in even external diameter of any length so that if the end of tube is made 16-gauge, then the middle of the tube will show, say 25-gauge. In other words, the tube is made thick where it is wanted and thin where specified, any variation of gauges being permissible. Tubes are also made thick in the center with a gradual tapering in gauge and show no appearance of tapering in internal diameter. This Mr. Ivins says is considered one of the greatest achievements ever known in tube making and completely explodes all known methods of making seamless tubing, which are usually made up by drawing the metal over a mandrel, arbor or ball plug. These tubes are made in any diameter from one-sixteenth of an inch to four inches or larger, and in length up to twenty feet.

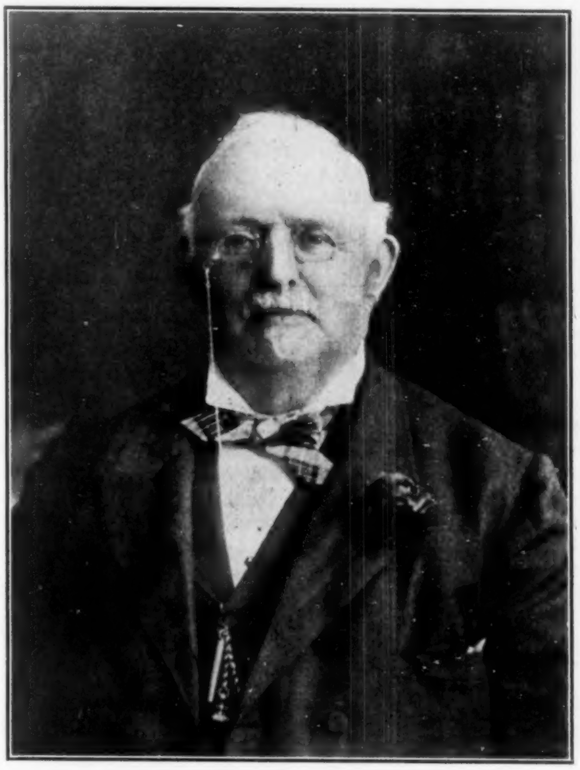
The Ellwood Ivins Works produce seamless brass and copper tubes from one-thirty-second of an inch in diameter up to three inches, and steel tubes are made from one-thirty-second of an inch to four inches in diameter, while the seamless crucible steel tubes are made up to three inches in diameter. The most marvelous thing about the product is that every tube is made accurate, both inside and out, to within one-one-thousandth of an inch.

Louis Schulte, formerly foreman plater for Tiffany Studios, New York, has served a three-year agreement with The Metal Finishers, Ltd., London, England, as works manager. This is the only concern in England which manufactures nickel plated steel sheets for stamping purposes. Mr. Schulte designed the London works and installed machinery based on his American patents. He has now returned to this country and taken charge of the plating and polishing departments of the Wisconsin Iron and Wire Works, Milwaukee, Wis.

DEATHS

THOMAS GEORGE LOCKER.

The death took place on June 6 of Thomas George Locker, who resided at Wood End Road, Erdington, Birmingham, England, at the age of 74. Readers of The Metal Industry will remember Mr. Locker through the biographical notice, with portrait, which appeared in May, 1907, in connection with the celebration of his 70th birthday. He had the distinction of spending the whole of his business life with the firm of Charles Clifford & Son, Ltd., of the Fazeley Street Rolling Mills. Commencing as office boy he became director and eventually general manager. He attained the position of secretary and manager in 1890. On the completion of his 50 years' service he was entertained at a complimentary dinner and presented with a cabinet of silver. Further presentations were made on March 12, 1907, when he reached his 70th birthday. Practically the whole of his leisure time was devoted to music, and at one time he had several musical societies running simultaneously, of which he was the conductor. The funeral was attended by Mr. A. H. Wolseley, secretary and managing director for Charles Clifford & Son, Ltd., and by Mr. C. H. Barwell, a director, on behalf of the company.



THOMAS GEORGE LOCKER.

Major Everett S. Horton, of Attleboro, Mass., died on June 3, from heart trouble, at the age of seventy-five years. Major Horton went to the front at the beginning of the Civil War, and was confined in Libby Prison for three months. After the war he became connected with The Horton & Angell Company, manufacturing jewelers of Attleboro, where he was actively in charge until a few years ago, when he retired. He served in the State legislature, was prominent in the G. A. R., and was a member of several clubs and associations.

Associations and Societies

DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

AMERICAN BRASS FOUNDERS' ASSOCIATION

President L. W. Olson, Mansfield, Ohio; Secretary and Treasurer, W. M. Corse. All correspondence should be addressed to the Secretary, W. M. Corse, 1155 Sycamore street, Buffalo, N. Y. **The objects of the Association are for the educational welfare of the metal industry. Annual convention with the American Foundrymen's Association in a succession of cities as invited. The next convention will be held at Buffalo, N. Y., probably in May, 1912.**

Secretary Corse, in the eighth bulletin of the American Brass Founders' Association, reports that the convention held in Pittsburg last May was the most successful in the history of the association. He announces the following new members: The Cochrane Brass Foundry, York, Pa.; Crane Company, Chicago, Ill.; W. & B. Douglas, Middletown, Conn.; The Georgian Manufacturing Company, Binghamton, N. Y.; Hersey Manufacturing Company, South Boston, Mass,; Indianapolis Brass Foundry, Indianapolis, Indiana; Otis Elevator Company, Yonkers, N. Y.; Star Brass Manufacturing Company, Boston, Mass.; American Brass Foundry Company, Milwaukee, Wis.; Bureau Brothers, Philadelphia, Pa.; General Electric Company, West Lynn, Mass.; J. L. Mott Company, Trenton, N. J.; J. B. McCoy & Son, New York, N. Y.; The S. Obermayer Company, Cincinnati, Ohio; Oliver Machinery Company, Grand Rapids, Mich.; Sherwood Manufacturing Company, Buffalo, N. Y.; The Wm. Tod Company, Youngstown, Ohio; Venango Manufacturing Company, Franklin, Pa.

BRASS MANUFACTURERS' ASSOCIATION

President, Theo. Ahrens, Louisville, Ky.; Commissioner, William M. Webster, Chicago, Ill. All correspondence should be addressed to the Commissioner, William M. Webster, 1112 Schiller Theater Building, Chicago, Ill. The objects of the Association are to promote in all lawful ways the interests of firms engaged in the manufacture of brass goods. Meets every three months. Each meeting fixes the place and date of the meeting to follow, consequently there is no stated place. It has been customary for the Association to hold its Annual Meeting in New York City in December of each year. The Semi-Annual Meeting is generally held at Atlantic City or some other Sea Coast town. The next meeting will be held in Cleveland, Ohio, September 20, 1911.

Commissioner Webster reports that the National Association of Brass Manufacturers held a very successful meeting in the Hotel Ponchartrain, Detroit, Michigan, on June 27, 1911. Among the variety of topics discussed was the matter of standardizing measures and openings, eradicating old and obsolete threads, the matter of legislation recently enacted by the different states with direct reference to the recent law passed in the State of Ohio, Senate Bill No. 479, which will materially alter the existing conditions and tend to bar the use of certain types of goods. Shipping classifications, freight rates, labor conditions and modern methods of producing goods were also among the things discussed.

ELECTRO-PLATERS' ASSOCIATION

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Royal F. Clark; Recording Secretary, Edward Faint. All correspondence should be addressed to the Corresponding Secretary, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

The twenty-ninth regular meeting of the National Electro-Platers Association was held June 23, 1911 in their meeting rooms at the Grand Opera House building, West 23rd street, New York City.

President C. H. Proctor presided and after opening the meeting in due form he most heartily welcomed Fred C. Clement, president of the Philadelphia branch. President Clement responded in a few well chosen remarks and brought the greetings of the Philadelphia branch.

The question of adopting a certificate of membership was discussed and on motion referred to the editor-in-chief.

George B. Hogaboom gave a very interesting lecture on chemistry, followed by a general exchange of views. He also explained a method for producing a permanent black on small parts.

Papers will be presented at the next regular meeting by Messrs. Hogaboom and William J. Schneider.

AMERICAN SOCIETY FOR TESTING MATERIALS

The fourteenth annual meeting of the American Society for Testing Materials was held at the Hotel Traymore, Atlantic City, N. J., Tuesday to Saturday, inclusive, June 27 to July 1. The total registration of attendance was over 450, the largest of any meeting yet held.

The tellers of election, Richard L. Humphrey and J. A. Capp, announced the unanimous election as members of the executive committee of W. A. Bostwick, metallurgical engineer of the Carnegie Steel Company, Pittsburg, Pa. (re-elected); Robert W. Hunt, Chicago, Ill.; Dr. Richard Moldenke, Watchung, N. J.; William R. Webster, Philadelphia (re-elected).

The society now has a total membership of 1,382, having approved 274 applications since the last meeting. The total loss from all causes was 172. Another indication of the high estimate in which the society is held is reflected in the sale of its publications, the total receipts from which amounted to $2,540, an increase of nearly $1,200 over last year. For the first time the society's books show a surplus. The deficit of $2,200 which existed a year ago has been wiped out and there is now a cash balance in the treasury of $6,792, with no outstanding liabilities.

Secretary Marburg made reference during the course of the meeting to the International Congress of the society which will be held in America in September, 1912. In this connection it was decided to hold the annual meeting of the American Society for 1912 at the usual time, but to receive at this meeting only committee reports, and allow the papers that may be contributed to be presented at the International Congress meeting in the fall.

BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

ATTLEBORO AND NORTH ATTLEBORO, MASS.

July 3, 1911.

The vacation season in the jewelry trade may be said to extend from the first of July to the middle of August, but as the firms have chosen different dates for their shutdowns, the town will not be wholly deserted at any time. The orders are reported fair, and returning salesmen tell of a growing prosperity that the sight of the growing, bumper crops has generated. The outlook for fall is good.

A most important conference was held in Providence recently by the advisory council of the New England Manufacturing Jewelers' and Silversmiths' Association, Superintendent of Schools Randall J. Condon, of Providence, and Superintendent of Schools Robert J. Fuller, of North Attleboro. The subject was the opening of the co-operative industrial schools in that city, and several of the manufacturers agreed to take a total of 30 boys on the half-time school and shop plan. One of the biggest employers in Attleboro stated to the writer that he would endeavor to secure one or two of the boys in order to work out the plan and find out its benefits and limitations as far as the local boys are concerned. The machinists' course in the Providence schools has already proved successful, and there seems no reason why the jewelers' course should not do as well.

William Nerney and Lester W. Nerney filed a bankruptcy partnership petition in the U. S. District Court in Boston June 5. They were doing business as the Douglas Novelty Company. Liabilities were placed at $21,764 and assets at $13,837. Individual liabilities of William Nerney were given as $15,608, of which $2,000 is secured, while $6,148 is stated as unsecured, $1,525 is accommodation paper and $5,900 is for notes and bills on which others are liable. His assets are set forth as $11,169 and include real estate valued at $4,450, machinery $6,000 and cash $70. Lester W. Nerney's individual liability is $3,500, all on accommodation paper.

A local firm is sending out an interesting circular to its customers, calling attention to the fact that when jewelry blackens the skin it does not necessarily mean that the jewelry contains brass. Too much sulphur in the body, experts say, is responsible for the blackening of the skin under bracelets or rings, even though these are of pure gold, and the oil of the skin is given as a contributory cause.—C. W. D.

NEW BRITAIN, CONN.

July 3, 1911.

New Britain's metal manufacturing industries are more prosperous at the present time than they have been in the summer for many years. Even for the holiday, when in past years it has been the custom to close many of the factories for several days or a week the majority of New Britain concerns gave their employees but a day this year. Nothing more clearly shows the prosperous condition of the manufacturing concerns of the city than the record of quarterly and semi-annual dividends which were paid the first of this month. They go to show the size as well as the prosperity of the "Hardware City's" several corporations whose product is manufactured metal ware of all kinds.

The American Hardware Corporation paid a 1½ per cent. dividend on $10,000,000, amounting to $150,000. A 2½ per cent. quarterly dividend was paid by the Stanley Works on its capital stock of $2,000,000. The amount of the dividend was $50,000. The Stanley Rule and Level Company paid 3 per cent. on $2,000,000, a dividend of $60,000. The total amount of the dividends paid the first of this month by metal ware manufacturing concerns in this city was over $350,000.

Manufacturing concerns in this city have made out a schedule of band concerts for the summer, and twice each week some one of the concerns furnishes the band for a public band concert. All of the expense of the summer's series of concerts is thus borne by the manufacturing concerns. The idea of manufacturer's band concerts it is believed originated in New Britain some years ago, and since then the manufacturing concerns of many other cities have "caught on" and adopted the plan.

The old smokestack at the Stanley Rule and Level plant has been torn down during the past week. A new concrete stack fifty feet higher than the old one was completed a short time ago, and after the new one began to be used the old stack was good for nothing to the concern. Because of an immense rush of structural steel business the plant of the Berlin Construction Company, near this city, is working night and day. This concern is just completing work on the structural steel portion of a new and large car barn in New Haven and has contracts enough on hand to keep a full force working long hours for many months to come.—A. L. M.

NEWARK N. J.

July 3, 1911.

There is little business being done in Newark at this time. Retailers are not stocking up, and the only orders coming in are for the summer resort trade. The fall trade will be fairly good, but there will not be any great rush such as people would like to see.

The Wolff-Trautz Company have taken up the line of platinum smelting and have put in an electric platinum furnace. Some large orders have come in from the West. L. Barnett & Co. have enlarged their jewelry factory, added twenty more benches and put on more hands. They have also bought the business of C. Cornehlson, of 102 Fulton street, New York City, and moved the plant here. E. G. Meeker has bought the brush plant of the American Oil and Supply Company at 46 Green street, and he is making wire brushes for the manufacturing jewelry, silversmith and metal working trades, as well as bristle brushes. The G. W. Fautz Company have succeeded F. A. Schlosstein & Company, of the Schlosstein building, making brooches and scarf pins, and have started making a general line of jewelry, as well as enlarging the line of rings. Charles A. Fautz and Charles A. Bladener are in charge of the factory end. William Fautz will go on the road. C. W. Hobbs has bought the property at Mulberry and Oliver streets and will erect a building for the manufacturing jewelry trade.

The Royal Silver Company, of 7 Oliver street, have made a change. Wolf T. Goldsmith has taken his partner's interest, Reuben Udell, and taken in a new partner, D. T. Politzer, formerly with the William Purnell Company, 37 Maiden Lane, New York City. They make mesh bags.

Henry Ziruth, who makes gold and platinum chains, is having a big demand for the latter, and as they are very tedious and slow to make the output is not large. He has put a new man, William Sharkey, on the road.

The Eagle Coloring Company, of 38 Crawford street, made some improvements to the place, so that the gold and silver work is conducted separately. E. H. Eastwood, of Bucher street, has been making a new line of pendants, gold and siver, 10 and 14-karat. John E. Ortner & Company, of 481 Washington street, are busy making a line of mesh bag frames of German silver and silver. The Art Metal Company have had good success with their new office in New York at Seventeenth street and Fourth avenue, which is in charge of F. W. Osgood, formerly sales manager for the Gilbert Clock Company. George A. Allsopp, Jr., is assistant manager of the factory here. The Jennings Silver Company, of Irvington, N. J., have made improvements to their factory, where they make sterling and silver plate toilet, manicure sets and novelties. Karl Bracher, Jr., bought out

his partners in the K. Bracher, Jr., Manufacturing Company, of Belleville, N. J., who make Arkansas and Washita oil stones for the trade, as well as high-grade jewels and agates. The business is being enlarged constantly. The oil stones come from their own quarry in Arkansas.—H. S.

BUFFALO, N. Y.

July 3, 1911.

A slight improvement is recorded by the metal working industries in this city. Buffalo and Niagara Falls are so closely related in these lines that business activity in one place is a pretty sure standard of business activity in the other city. While June opened with a discouraging dullness, a slight increase was felt during July. This was especially the case in the manufacture of jewelry and silversmithing. Reports from the salesmen who came in from the spring trips indicate a fair fall business for all jewelry lines. The books of 1912 will show a good average on the side of better business, and this feeling is shared generally by all manufactories engaged in the metal industries.

The most important event of the month was the visit of the members of the Foundry Machine and Exhibit Company who came to inspect this city's facilities for the convention of the American Foundrymen's Association next year. The exhibit company is one of the allied concerns that meets at the same time as the Foundrymen's Association proper. The other allied intsitutions are the Associated Foundry Foremen and the American Brass Founder's Association. In charge of the exhibit company is the huge display that was made at Pittsburg. The officials of the company who were here on the inspection trip were President George R. Rayner; Secretary C. E. Hoyt, and Messrs. F. W. Perkins, H. R. Atwater, R. S. Buch, H. D. Miles, of Buffalo, five vice-president of the American Foundrymen's Association and vice-chairman Frank W. Tracy, of the convention committee of the Chamber of Commerce. The local situation was also discussed by C. W. Sherman, Henry W. Werdt, Walter F. Semon, W. M. Corse, and Commissioner of Conventions, George C. Lehman. One entire morning was spent at the Broadway Arsenal, and the plans for the improvements were looked over. It is feared that the Arsenal will not be large enough for the proposed exhibit which requires 30,000 feet more of space than was used at the Pittsburg exhibit in the spring.

J. R. Lawrence is now the manager of the Buck Plating Company of Salamanca, N. Y. The Buck Plating Company was recently incorporated with a capital stock of $40,000, and formerly did business under the name of the Buck Silver Company. The output of the factory includes a line of quadruple silver plate, table silver and trays with other novelties. Another incorporation in Buffalo is the Buffalo Aluminum and Bronze Company, of this city. The capital stock is $25,000, and the incorporators are G. W. Morris, J. G. Panell, and E. G. Northrup.

The Electric Smelting and Aluminum Company, of Lockport, N. Y., is working on full time and has increased its facilities for turning out the best quality of metals and alloys. There has been an increased demand for the mineral cleaner for electroplaters. This is one of the special features of the manufactory.—McG.

CLEVELAND, OHIO

July 3, 1911.

Business with the metal producing and handling companies in Cleveland during the past month has been about normal. The hot weather has had some effect in slowing up manufacturing along all lines, together with political uncertainties. Buying of raw materials has not been as heavy as some of the wholesalers might like to see it, but the volume of manufactured stock which is being turned out in this territory is about as heavy as usual.

The heavier lines are in automobiles and plumbing fixtures. Auto business is quite brisk and a large number of machines are being turned out. Cleveland is noted especially for its high grade cars, there being no plants located here which manufacture the cheaper lines. In fact the Chamber of Commerce but recently discussed the advisability of attracting to the city some companies which will produce popular priced cars.

The active building season which is being experienced throughout the entire country has had a good effect on plumbing fixtures such as manufactured here. Bathtubs, and the usual steel fixtures are not made here, but this is an unusually important center for faucets and copper and brass goods of all kinds for the plumbers' use. The manufacturers say that the outlook for their goods is particularly bright for this time of the year.

Business is brisk with the gas fixture manufacturing companies located here, the building boom helping them just as much as the plumbing fixture people. Cleveland is becoming a big center for brass goods in chandeliers and wall brackets, and some strong companies are now located here.

One of the new companies which has been incorporated in Cleveland for the manufacture of fixtures is the Plumbers' Fixture Manufacturing Company, with a capital of $10,000. The incorporators are W. H. Dettlebach, W. J. Bergens, O. P. Strong, Walter McMacon and I. Gross.

Another company incorporated in Ohio during the past month was the Ohio Metals Treatment Company, at Cincinnati, with a capital of $200,000. E. J. Bobbett is the chief incorporator, according to advices from Columbus, where papers were filed.—S. M.

DETROIT, MICH.

July 3, 1911.

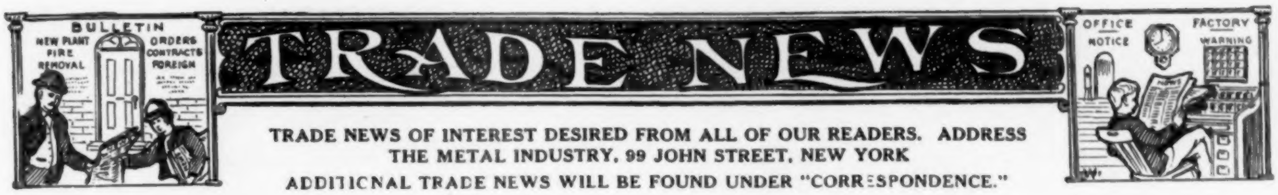
Detroit manufacturers are anxiously waiting the disposition of the reciprocity treaty between the United States and Canada. To a man they are in favor of the proposed trade relations and when the matter is settled one way or another a decided change in manufacturing interests will be noted here. This applies particularly to the brass and automobile industry.

The general brass manufacturing and wholesale jewelers are turning out a considerable amount of work, although they might be doing better. There seems to be a fair demand for general plumbers' supplies and the local plants are doing fairly well. It is the same old story with the automobile industry. This business was never better. It was predicted long before this that there would be a slump, but thus far nothing of the kind has occurred. Instead, the business continues at a high water mark, although there is no doubt there will be a let-up before the end of the summer.

The Ford factory is running briskly with over 4,000 men and is turning out great numbers of machines. These are well covered with brass parts which, of course, provides much work for the different concerns which are engaged in this line of manufacture. The Cadillac Automobile Company also is running with a large force as well as the Packard, the Chalmers, Hup-mobile Company, the Hudson, the E. M. F. and all the other large concerns. This brisk business stimulates all other industries in the city, which no doubt would show a falling off if the automobile companies were not so rushed.

That the ratification of the reciprocity treaty will help Detroit manufacturers, or at least the brass and automobile institutions, has been pointed out by Frank Reid, of J. W. Reid and Son, London, Ontario, who recently was a visitor at the Universal Motor Truck Company, in Detroit. Mr. Reid said that he had just completed a trip through to the Canadian Pacific coast in the interest of his firm and found people alive to the advantages of the commercial vehicle. The new treaty calls for a 5 per cent. reduction on the present 35 per cent. duty on American automobiles, he said, and this will help considerably in pushing the sales of the machines.

The Motor Wagon Company is one of the latest concerns to establish business in Detroit. The officers are: President, Strathern Hendrie; vice-president, Philip McMillan; treasurer, Fred M. Alger; secretary, W. Howie Muir. The general manager is Alfred C. Burch. The combination of the names of these young business men whose families are at the foundation of financial Greater Detroit, represents easily $25,000,000. This firm will place a staunch, moderate-priced truck on the market. The factory has been opened at St. Antoine street and the Michigan Central railroad.—F. J. H.



TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

William Hess, of Manitowoc, Wisconsin, and others, are putting in a brass foundry to manufacture special valves.

The Gobeille Pattern Company, manufacturers of stove patterns, Niagara Falls, N. Y., have recently started a branch shop at Niagara Falls, Ontario.

The Rome Manufacturing Company, Rome, N. Y., owing to a congested condition in parts of their plant, are adding another story, 40 by 160 feet, on one of their buildings.

The Jonathan Bartley Crucible Company, Trenton, N. J., report through Lewis H. Lawton, secretary, that their plant is running to full capacity and that they expect to install some new machinery.

The Universal Machine Company, brass and iron founders, Toledo, Ohio, who have recently increased their capital stock from $25,000 to $100,000, will move their factory to Bowling Green, Ohio, in October.

The Osborne & Stephenson Manufacturing Company, Plainville, Conn., are at present running a brass foundry in connection with their other business and are open for contracts in bronze, brass and aluminum castings.

The Crescent Tool Company, manufacturers of special machinery and hardware specialties, Jamestown, N. Y., are having plans prepared for a two-story brick addition, 50 by 132 feet, to their present plant, which will be used for manufacturing purposes.

The Republic Metalware Company, manufacturers of stamped, pieced, japanned, galvanized and enameled ware, etc., Buffalo, N. Y., are about to erect a one-story pickeling house and a three-story building for machine shop and addition to their plant.

The Standard Brass Casting Company, Cal., moved into their new plant, Third and Jefferson streets, on June 1. Their foundry, which is 100 feet square, is equipped for the manufacture of brass castings. The company have also let the contract for an additional brick building 40 by 100 feet, two stories.

It is announced that the firm of Clum & Atkinson, brass founders and manufacturers, Rochester, N. Y., is dissolved, Philip A. Clum withdrawing from the partnership and George Atkinson succeeding to the business. This dissolution took effect June 1, 1911. Mr. Atkinson assumes all of the liabilities of the firm and all accounts owing to the firm are payable to him.

The published reports in the current trade press that the Bridgeport Coach Lace Company, manufacturers of automobile and carriage trimmings, Bridgeport, Conn., would add a small brass foundry to their plant, is contradicted by the company, who state that they have only been considering a brass foundry and will not do anything about it at present.

Wm. H. Flavin, 247 Center street, New York, who has conducted a plating and polishing business at that address for a number of years, is branching out into the supply line. He now carries a full line of platers' and polishers' supplies and will make a specialty of furnishing such goods and equipment to users on an annual contract basis. Mr. Flavin will continue to do contract work in plating and polishing as heretofore.

The Thomas W. Pangborn Company, Jersey City, N. J., have consolidated their executive sales, accounting and purchasing divisions, formerly located at 90 West street, New York City, at their Jersey City plant, Hudson and Morris streets, where the show rooms, manufacturing and engineering divisions are located. This change was made desirable owing to the growing importance and development of the manufacturing and engineering divisions.

Hannifin Manufacturing Company, Chicago, Ill., is a newly incorporated concern under the laws of Illinois, with a capital of $12,000 fully paid in, to manufacture and deal in pneumatic chucks, countershafts and other air-operated machines. The officers are: M. J. Hannifin, president; H. A. Schultz, vice-president; A. V. Hannifin, secretary and treasurer. The Messrs. Hannifin are well known in the brass working trade, having been in this business for many years.

The Peck, Stow & Wilcox Company, manufacturers of mechanics' hand tools, tinsmiths' machines, builders and general hardware, will erect the following brick and steel construction buildings to their plant at Southington, Conn.: A five-story machine shop 50 by 300 feet, a one-story forge shop 60 by 400 feet, a one-story foundry 60 by 210 feet, with annex 30 by 112 feet; a one-story building for miscellaneous purposes, 40 by 112 feet; a wood-working building 40 by 154 feet, and a power house 40 by 110 feet.

The Willsea Works, a new $30,000 corporation of Rochester, N. Y., announce through L. P. Willsea, who will be the president and treasurer of the new company as soon as the organization and transfer has been completed, that they have bought out the interest of the Jones heirs in the foundry, machine and pattern shops, established in 1842 by Ezra Jones. The new concern will continue to make wood and metal patterns, machine castings, large and small machine work, forgings, flue welding, tool dressing, and will also do contract work.

The Ironton Punch and Shear Company, formerly the Olive Foundry and Machine Company, Ironton, Ohio, have purchased the equipment of the Cincinnati Punch, Shear and Roll Company's plant at Cincinnati, O., and will remove it to Ironton, and will manufacture the punches, shears, rolls, etc., which were formerly made by the latter company. A new building 90 by 264 feet, with a 27 foot wing will be erected, equipped with a 30-ton electric traveling crane, and will be divided into foundry, machine shop and boiler shop.

American manufacturers and producers are invited to file with the American consul in each foreign country a statement respecting the lines of goods that they have to offer to foreign buyers. The gathering of this information, by means of which it is hoped to place with each American consul an encyclopædia of the industries of the United States, is in the hands of the Commerce Bureau Company, who are co-operating with the Department of State, and the entire work is done without charge to the manufacturer. Full particulars may be obtained by addressing the Commerce Bureau Company, 50 Church street, New York City.

The Smithfield Garage and Machine Company, brass and iron founders, plumbers and machinists, Smithfield, N. C., announce that they have recently purchased the large and complete plant of the Selma Iron & Machine Company, including their machine shop, brass and iron foundry. They have also purchased considerable machinery and are now prepared to do any kind of machine work. The machine department will be in charge of

J. R. Lewis, who has had over forty years' experience in this business. The company also state that their brass and iron foundries are in charge of an experienced moulder and foundryman and they are prepared to take care of any orders from making a small pin to the largest kind of a casting.

The report that contracts have been awarded by the Chicago Pneumatic Tool Company, Chicago Heights, Illinois, for the erection of several additions to its plant, is incorrect. The company have rented a factory at Chicago Heights, where they manufacture gasoline cars for railway service, which affords them ample facilities for some years to come.

The Wright Chemical Company, 38 Park Row, New York, manufacturers of nitro-cellulose, lacquers, amyl acetate, etc., advise us that their plant near Kenilworth, N. J., is completely equipped for manufacturing lacquers of all kinds, from common grades to the highest. They have their own exclusive formulas or will match any samples submitted to them. This firm is independent of all other lacquer manufacturing concerns.

The report of the Westinghouse Electric and Manufacturing Company, Pittsburg, Pa., and its subsidiaries for the year ended March 31, records the largest year's business in both gross earnings and net income, in its history. The gross earnings exceeded those of the preceding fiscal year by $8,870,630, and were greater by $5,093,072 than the earnings of the best previous year of the company's existence. The gross earnings were $38,119,312 and costs $32,510,547, leaving the net manufacturing profits $5,608,765. Other income amounted to $1,515,532, and deductions for interest, depreciation of plant, etc., were $2,243,191, making the surplus for the year $4,881,106.

The Niagara Falls Metal Stamping Works, of Niagara Falls, N. Y., U. S. A., have let a contract for an addition to their present buildings. It will give them two floors and a basement each 60 feet x 100 feet. The basement is high enough for machinery, and in part at least, will be well lighted by natural light. Their present basement is sufficient for their heating plant and fuel storage. The new basement will have a 20-foot x 36-foot fireproof vault for storing dies. Work has already commenced upon the contract and all material ordered. It is to be ready for occupancy some time in August. This will give them room for more and heavier machinery, which they much need. When completed and new machinery in they will be as well equipped for doing specialty jobs as any manufacturing plant in this country. This will be the third enlargement in seven years.

In the United States circuit court at Hartford, Conn., a motion brought by the Globe Machine and Stamping Company, of Cleveland, Ohio, for a temporary injunction to restrain George A. Abbott from manufacturing the Abbott tumbling barrel was denied. George A. Abbott was the inventor of a tumbling barrel for use in polishing metal goods with steel balls. He obtained patents on the invention and assigned his interest in them to the Globe Machine and Stamping Company. According to Mr. Abbott's attorneys the latter company agreed to manufacture the invention for the benefit of the general trade. Mr. Abbott claims that they failed to do so and that this constituted a breach of contract and rendered the assignment of the patent invalid. This was denied by the Globe Machine and Stamping Company, but the court refused to grant an injunction and the situation remains as it was until the case is decided on the final issue. It is understood that meanwhile Mr. Abbott will continue to manufacture the barrels.

INCREASE OF CAPITAL STOCK

The Great Lakes Welding Company, Cleveland, Ohio, has increased its capital stock from $20,000 to $50,000.

The Artistic Bronze Company, South Norwalk, Conn., has increased its capital stock from $20,000 to $40,000.

REMOVALS

I. Shonberg, Brooklyn, N. Y., has removed his smelting works and office to 122 Flushing avenue.

The Ledell-Bigelow Company, metals and alloys, removed their New York office, June 1, to 30 Church street, Hudson Terminal building.

J. M. Betton, manufacturer of "The Drucklieb" injector sand blast apparatus, New York City, has removed from 178 Washington street to 14 Park place.

The Pittsburg White Metal Company, manufacturers of babbitt and anti-friction metals, Pittsburg, Pa., has removed its offices to the Diamond Bank building.

The American Lead Company, manufacturers of lead, tin and chemical pipe, wire solder, art glass lead, lead drum traps, etc., Pittsburg, Pa., has moved its general offices from 3112 Penn street, where the plant still remains, to 508-509 Diamond Bank building.

The Thomas W. Pangborn Company, manufacturers of sand blasts and other specialties in foundry equipment, announce that owing to the development of their business the executive, sales, accounting and purchasing divisions, which have for some years been located at 90 West street, New York, have been moved to Jersey City, where the manufacturing and engineering departments have been located for some time at Hudson and Morris streets. This is within fifteen minutes of the New York City Hall.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

The Aluminum Pump Valve Company, Cleveland, Ohio. Capital, $20,000. To manufacture a new pump valve. Manager, James E. Householder.

Hard Iridium Pen Company, West Orange, N. J. Capital stock, $25,000. Incorporators: S. H. Benson, Joseph G. Young and William J. McFadden.

Lamb-Robinson Equipment Company, Portland, Me. Capital, $100,000. To manufacture iron, steel, brass, etc. President, E. B. Lamb, Portland; treasurer, A. W. Robinson, Boston.

Wolberg-Robinson Metal Company, Philadelphia, Pa. Capital stock $10,000. To deal in white metal, solder and tin stock. Incorporators: Samuel Wolberg, I. Brod and L. C. Robinson, all of Philadelphia.

Cleveland Smelting Company, Cleveland, Ohio. Capital stock, $25,000. To smelt, refine and deal in ores and metals. Incorporators: W. A. Bickford, C. H. Bickford, C. V. Burke, J. A. Burke and W. A. Byrnes, all of Cleveland.

Eastern Chemical and Metallurgical Company, Bayonne, N. J. Capital stock, $750,000. To manufacture chemicals and for the reduction and smelting of mineral-bearing ores. In-

corporators: Charles H. Stillman, Walter M. Yeager and Benjamin C. Harvey.

Nickerson Art Metal Company, Pawtucket, R. I. Capital, $100,000. To manufacture, buy and sell metal goods and novelties, metal findings, automatic machinery, wire goods and mesh purses. Directors: Mark E. Nickerson, Richard S. Sänderson and James J. McGinnity, Jr.

Ohio Valley Brass and Iron Company, Wellsburg W. Va. Capital stock, $75,000. To manufacture, convert and treat brass, steel and iron in all forms. Incorporators: J. V. Kennedy, C. H. Frazier and W. M. Pattison, of Cleveland, Ohio; T. J. Whearty, Lakewood, Ohio; S. George, Wellsburg.

PRINTED MATTER

Fuel Oil Burner.—Circular No. 134, issued by Tate, Jones & Company, Inc., engineers and manufacturers, Pittsburg, Pa., describes the portable fuel oil burner, compressed air type, known as the Kirkwood, manufactured by this company. Sample copies on request.

Wheel Brushes.—The Riehl wheel brushes of wire, tampico, bristle, horse hair and scratch brushes manufactured by the Riehl Manufacturing Company, Cleveland, Ohio, are described in a catalogue just issued by this company. Copies may be obtained upon request.

Aluminum.—The Lumen Bearing Company, brass founders, Buffalo and Toronto, have issued a brief treatise on aluminum. This treatise is the second one of a series which the company are putting out, which series will deal with the line of metals and castings produced by them.

Florentine Brass.—The Benedict Manufacturing Company, Syracuse, N. Y., has issued a handsome folder descriptive of their new designs in art metal work. These designs are carved on brass in genuine hand engraving and incorporate floral motives, such as lily of the valley, tulip, poppy, chrysanthemum and iris. The work is finished in artistic dull brass.

Colors.—A handsome little chart giving a reproduction of the shades and the prices of the air brush powder colors is being distributed by the Paasche Air Brush Company, Chicago, Ill. It is said by the manufacturers that these colors can be diluted in water, oil or alcohol and that a single set of these colors will be found of great practical value to anyone using an air brush.

Tools for Retail Fixture Dealers are described in a recent circular issued by the Goshen Stamping and Brass Company, Goshen, Ind. This company manufactures interchangeable lighting fixtures for either gas or electricity, and also the tools required for the manufacture of such fixtures. These tools include hand punches and dies, pipe stock and dies, hack saw frames and blades.

Electric Pyrometers.—The Wilson-Maeulen Company, makers of electric pyrometers, New York, have issued a hanger card, giving the melting points, both Centigrade and Fahrenheit, of all the elements on one side, and the other contains a table for the exact conversion of Centigrade degrees to Fahrenheit and vice versa. This hanger is a valuable one for laboratory and foundry use, and will be sent upon request.

Soot Cleaner.—The Vulcan Soot Cleaner Company, manufacturers and installers of the Vulcan Soot Cleaner, Pittsburg, Pa.; G. L. Simmons & Company, Chicago, Ill., sales department, have issued a comprehensive pamphlet, giving a complete illustrated description of the Vulcan Soot Cleaner, which is applicable to all kinds of power-producing machinery. Copies of the pamphlet will be sent upon request by G. L. Simmons & Company.

Electro-metallurgy.—Marcus Ruthenberg, of Kingsway, London, England, describes the Ruthenberg system of electro-metallurgy in a 10 by 12-inch phamphlet recently issued. This pamphlet gives a complete description of the various Ruthenberg processes and is fully illustrated with photographs of the machinery used in such process. The Ruthenberg metallurgical apparatus is manufactured by the Brush Electric and Engineering Company, Ltd., Loughborough, England.

Aluminum Alloy.—The United States Macadamite Company, Brooklyn, N. Y., have issued a folder giving detailed information regarding Macadamite. This metal is claimed to be the strongest light metal made and it is stated that its field and uses are practically identical with that of brass and bronze but that it has many superior advantages. The announcement is made that Macadamite at its present low price is widening its field of application and has become a very practical proposition.

Bronze Castings.—The American Manganese Bronze Company, manufacturers of high grade bronzes, Holmesburg, Pa., have issued a unique and useful souvenir in the shape of a pasteboard wallet, 9½ by 4 inches. On the inside of this wallet is given data relating to the various bronzes manufactured by this company, among which are manganese, phosphorus, government gun, mill bearing and white bronze. In tension and compression tables are given showing the results that have been attained by these metals. These wallets will be sent to interested parties upon receipt of a postal card.

Brass and Copper.—The U. T. Hungerford Brass & Copper Company, dealers in brass, copper, Tobin bronze, yellow metal, etc., New York, have issued a circular letter, illustrative of the extensive line of goods handled by them. This company state that they carry stock of over three million pounds at their New York headquarters, which enables them to execute orders for stock sizes promptly. The letter circular is very comprehensive as it gives in sufficient detail a description of each item of this enormous stock for prospective customers to pick out and order just what their requirements demand. A stock catalog, giving information regarding the full line, is given upon request.

CATALOGUE EXHIBIT

An exhibition of every kind of catalogue may be seen at The Metal Industry office, 99 John street, New York. The Metal Industry is prepared to do all of the work necessary for the making of catalogues, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

AD NEWS

The Osborn Manufacturing Company, 5407 E. Hamilton avenue, Cleveland, Ohio, devote a page to illustrating and describing the Economy Wire Wheel brush, one of the best known make of brushes on the market.

The Uraniumite Company of America, Erie County Bank Building, Buffalo, N. Y., give, on another page, some particulars of Uraniumite, which they name the only assimilator and scavenger of all metals.

In the June issue a note about the Basic Mineral Company, Pittsburg, Pa., gave the name of C. M. Miller as proprietor of the company. Mr. Miller states that he is simply the manager. He is also the inventor or discoverer of radio-clarite and other fluxes for brass and bronze.

INFORMATION BUREAU

Any firm intending to buy metals, machinery or supplies, and desiring the names of the various manufacturers and sellers of these products can obtain the desired information by writing to The Metal Industry. Commercial questions are answered by return mail. Our Information Bureau is for the purpose of answering questions of all kinds. Address The Metal Industry, 99 John street, New York.

METAL MARKET REVIEW

New York, July 10, 1911.

COPPER.

Standard Copper in London has been active and higher, and prices at the close of the month are nearly £2 per ton above the opening. Spot standard closed at £57 against £55 3s. 9d., June 1.

With the strong foreign market and steadily increasing prices in standard home consumers for the first time in many months came into the market and bought freely as long as London continued to advance, but as soon as London began to take profits and prices sagged, consumers were inclined to hold off and prices at the close are a few points below the highest. Foreign business is good and from £54 to £55. Germany has been a heavy buyer. When the market got to £55 and £56 home consumers came in, and had the foreign market held the trade here would have stayed in. Americans like to buy on a rising market while the Germans and British will take Copper every day at around £52 to £54 because it is cheap. Lake advanced very close to ½ per cent. per pound during the month, but at the close is a few points from the highest—at 12.75 to 12.80. Electrolytic at 12.75, and Casting at 12½ to 12.60.

The exports were very heavy, 30,074 tons for the month against 23,430 tons for the same period last year. The European statistics show a reduction of the visible supply in England and France of close to 2,500 tons during the month, and making a reduction in the total visible supply since the first of the year 13,700 tons or over 30,000,000 pounds. It is expected that the domestic stocks as compiled by the Copper Producers Association will show a decrease for the month of June.

TIN.

£210 per ton for spot tin looked high on the first of June. Since then, however, the price was put to £233 and some settlements, it is reported, were made at £250 per ton; just so much the "Bears" had to pay for selling something they did not possess. The fluctuations have been very violent and the trade here had to get along the best way they could with as little Straits as possible and as much "off grade" tin as they could use. Price of spot tin dropped off very rapidly after all the shorts had been up to the "captain's office." At the close of June, spot tin in London was quoted at £195 10s. and futures at £190. Spot tin in New York reached 50 cents per pound in a retail way during the squeeze. Today the market is around 44½ cents for spot, 43 cents for July delivery, down to 41.75 for September.

Consumption was small—2,900 tons for the month against 3,400 tons in May. The statistics for the month show very little change; the visible supply increased about 700 tons during the month.

It is well to remember that the syndicate absolutely control the stocks of tin in the London market and they can put prices just about where they please and from the way they played the market during the month of June they do not seem to be in it solely on account of their health.

LEAD.

The foreign lead market stays around £13 7s. 6d.

In the New York market there has been very little change. Prices have ranged from 4.45 to 4.50 New York delivery for carload lots. In St. Louis from 4.20 to 4.35 East St. Louis delivery at the close.

SPELTER.

The foreign market is strongly held at £24 to £24 15s. at the close.

There has been a better demand for spelter and prices have been advanced about 35 points, opening at 5.50 New York to 5.80, 5.85 at the close. In St. Louis prices have been manipulated as usual by the "Big 3" and at the close the market is easier at about 5 points down from the highest.

ALUMINUM.

The market for aluminum has been easier and more or less unsettled at around 20c. per pound. This price has been shaded for attractive business. Small lots are quotable at 20½ to 21 cents.

ANTIMONY.

The much talked about foreign syndicate seems to have made a botch of it. Prices are lower all around and the lower prices go the more antimony there is offered. Cooksons today is quotable at 8½ cents against 9 cents and 9½ cents last month; Halletts today at close to 8 cents against 8⅞ cents; Chinese and Hungarian around 7¼ cents against 7¾ cents a month ago.

SILVER.

Very little change in silver prices in London, opening at 24 9-16 and closing at 24 5-16. In New York market closes at 52⅝ for the official settlement price.

QUICKSILVER.

Rothschild London market price is £8 5s., second hands, £8 2s. 6d. In New York the wholesale trust price is $44.00 per flask, jobbing lots at $44.50 to $45.00.

PLATINUM.

Foreign advices quote the market abroad active and higher. Prices here are unchanged at $44.50 for hard and $42.50 for ordinary refined.

SHEET METALS.

The base price for sheet copper is quotable at 16¼ cents. Wire is higher at 13¾ base. Copper-clad steel wire is quotable at 13 cents base. The brass manufacturers have advanced prices ⅛ cent per pound, making base price 13⅜; this price, however, will probably be cut by outsiders.

OLD METALS.

The old metal market has been rather more active in the advancing London market for Standard Copper than has been a good foreign demand for copper scraps and prices are a shade higher all round.

COPPER PRODUCTION.

(Issued by the Copper Producers' Association.)

July 10, 1911.

		Pounds.
Stocks of marketable copper of all kinds on hand at all points in the United States, June 1, 1911......		165,995,932
Production of marketable copper in the United States from all domestic and foreign sources during June, 1911..........		124,554,312
		290,550.244
Deliveries:		
For domestic consumption.......	61,655,561	
For export	71,460,519	
		133,116,080
Stocks of marketable copper of all kinds on hand at all points in the United States, July 1, 1911...		157,434,164
Stocks decreased during the month of June........		8,561,768

JUNE MOVEMENTS IN METALS

Copper.	Highest.	Lowest.	Average.
Lake	12.90	12.35	12.60
Electrolytic	12.80	12.25	12.50
Casting	12.60	12.10	12.35
Tin	48.60	44.00	46.20
Lead	4.50	4.45	4.50
Spelter	5.85	5.50	5.70
Antimony (Hallett's)	9.00	8.10	8.50
Silver	.53⅜	.52¾	53.04

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn.

1910—Average for year 13.13½. 1911.—January, 12⅞; February, 12¾; March, 12½; April, 12½; May, 12⅜; June, 12⅝.

Metal Prices, July 10, 1911

NEW METALS.

	Price per lb. Cents.
Copper—Pig, Bar and Ingot and Old Copper. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	12.80
Electrolytic, carload lots	12.75
Casting, carload lots	12.60
Tin—Duty Free.	
Straits of Malacca, carload lots	44.75
Lead—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.50
Spelter—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	5.80
Aluminum—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	20.00
Antimony—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.50
Hallett's cask lots	8.00
Chinese	7.25
Hungarian grade	7.25
Nickel—Duty Ingot, 6c. per lb. Sheet, strips and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots, Blocks according to quantity	.43 to .60
Manganese Metal—Duty 20 per cent.	.90
Magnesium Metal—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.50
Bismuth—Duty free	2.10
Cadmium—Duty free	.85
Chromium Metal—Duty 25 per cent. ad val.	.98
	Price per oz.
Gold—Duty free	$20.67
Silver—Duty free	.52⅝
Platinum—Duty free	42.50
Quicksilver—Duty 7c. per lb. Price per pound	.67

OLD METALS.

Dealers' Buying Prices. Cents per lb.		Dealers' Selling Prices. Cents per lb.
10.75 to 11.00	Heavy Cut Copper	12.00 to 12.25
10.50 to 10.75	Copper Wire	11.50 to 11.75
9.75 to 10.00	Light Copper	10.50 to 10.75
9.25 to 9.50	Heavy Mach. Comp.	10.50 to 10.75
7.00 to 7.25	Heavy Brass	8.00 to 8.25
5.50 to 5.75	Light Brass	6.75 to 7.00
7.00 to 7.25	No. 1 Yellow Brass Turnings	7.75 to 8.00
8.00 to 8.25	No. 1 Comp. Turnings	8.75 to 9.00
3.90 to 4.00	Heavy Lead	—— to 4.25
3.75 to 3.90	Zinc Scrap	—— to 4.25
5.00 to 5.50	Scrap Aluminum, turnings	6.00 to 7.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.

			Price per lb. Cents.
Silicon Copper, 10% to 20%	according to	quantity	28 to 35
Silicon Copper, 30% guaranteed	"	"	38
Phosphor Copper, 5%	"	"	19 to 21
Phosphor Copper, 10% to 15%, guaranteed	"	"	28 to 30
Manganese Copper, 30%	"	"	30 to 35
Phosphor Tin	"	"	34 to 36
Brass Ingot, Yellow	"	"	8½ to 9½
Brass Ingot, Red	"	"	11 to 12½
Bronze Ingot	"	"	10 to 11
Manganese Bronze	"	"	17 to 19
Phosphor Bronze	"	"	13 to 16
Casting Aluminum Alloys	"	"	29 to 35

Phosphorus—Duty 18c. per lb.
According to quantity .... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 16.50 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

Cents Per Pound Over Base Price for Soft Copper.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7¾ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7¾ lb. sheet 30 x 60.	Lighter than 8 oz.
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches.	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered at its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add .... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add .... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness .... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness .... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ⅝ inch diameter or over .... Base Price.

(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

ZINC—Duty, sheet, 1⅝c. per lb.	Cents per lb.
Carload lots, standard sizes and gauges, at mill	7.50 less 8%
Casks, jobbers' prices	8.00
Open casks, jobbers' prices	8.50

Metal Prices, July 10, 1911

PRICES ON BRASS MATERIAL—MILL SHIPMENTS,

In effect July 1, 1911, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13⅝	$0.14⅝	$0.15⅞
Wire	.13⅝	.14¾	.15⅞
Rod	.13⅝	.15½	.16⅞
Brazed tubing	.18½	——	.20⅝
Open seam tubing	.16½	——	.18⅝
Angles and channels, plain	.16¾	——	.18⅝

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass... ½c. per lb. net advance
" —Best spring, drawing and spinning brass.... 1½c. " " " "
Wire—Extra spring and brazing wire............ ½c. " " " "
" —Best spring and brazing wire............... 1c. " " " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14⅝	$0.15¾	$0.16⅞
Wire	.14⅝	.15¾	.16⅞
Rod	.14⅝	.16½	.17⅞
Brazed tubing	.19½	——	.21⅝
Open seam tubing	.17½	——	.19⅝
Angles and channels, plain	.17¾	——	.19⅝

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass... ½c. per lb. net advance
" —Best spring, drawing and spinning brass.... 1½c. " " " "
Wire—Extra spring and brazing wire............ ½c. " " " "
" —Best spring and brazing wire............... 1c. " " " "

BARE COPPER WIRE—CARLOAD LOTS.

13.75c. per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order.......... 17½c. per lb. base
100 lbs. to 300 lbs. in one order.......... 18c. " " "
Less than 100 lbs. in one order.......... 19½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1⅛ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 55 and 5%.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod .... 16c. net base
Muntz or Yellow Metal Sheathing (14" x 48").......... 14c. " "
" " " Rectangular sheets other than Sheathing 16c. " "
" " " Rod .... 14c. " "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 22⅝c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than........ and including.....	3in. 12in. in coils.	6in. 14in.	14in. 16in.	16in. 18in.	18in. 20in.	20in. 24in.	24in. 30in.	30in. 36in.	36in. 40in.
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	42
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	73
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 8 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S. G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.60
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent. to No. 19, B. & S. Gauge, inclusive.......... $0.60
6 " " 19, " " " .... .70
9 " " 19, " " " .... .85
12 " " 19, " " " 1.00
15 " " 19, " " " 1.15
16 " " 19, " " " 1.20
18 " " 19, " " " 1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.

URANIUMITE

THE ONLY ASSIMILATOR AND SCAVENGER OF ALL METALS.

What It Is

Uraniumite is a metallic powder, ready for use without treatment or preparation. It is mixed in with the charge before melting, a small quantity (1 pound for every 100 pounds of metal) being distributed near the bottom of the crucible throughout the metal forming the mix.

What It Does

Uraniumite greatly increases the fluidity, resulting in a closer grained, homogeneous and tougher but not harder metal.

It lessens shrinkage and blow holes and practically prevents honeycombed metal.

It increases the tensile strength and elongation.

It permits entire charge of scrap.

It reduces losses from defective castings.

What It Does Not Do

It does not change the chemical combination but simply removes the impurities.

It does not harm the crucible but rather lengthens its life.

It does not add to the cost of production but lowers it materially. 75% of its weight is added to the poured metal.

Uraniumite is compounded for grey iron, steel, brass, bronze, aluminum, gun metal and crucible steel.

Should you desire further information, write for circular "A," stating which compounds you are interested in.

THE URANIUMITE COMPANY
OF AMERICA

ERIE COUNTY BANK BLDG., BUFFALO, N. Y.

DIRECTORY

METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

Hendricks Brothers
Manufacturers of
Sheet and Bar Copper
COPPER FIRE BOX PLATES
and STAYBOLTS
WIRE and BRAZIER'S RIVETS
Importers and Dealers in
INGOT COPPER, BLOCK TIN,
SPELTER, LEAD, ANTIMONY
BISMUTH, NICKEL, Etc.
49 Cliff Street New York

Established 1802 Cable address, "Scovill"
Scovill Mfg. Co.
WATERBURY, CONN.
BRASS ROLLING MILLS
WIRE MILLS
FACTORIES for the manufacture of various articles made of brass or German Silver.
DEPOTS:
NEW YORK - BOSTON - CHICAGO

Waterbury Brass Co. General Offices, Mills and Factories
WATERBURY, CONN.
NEW YORK OFFICE, 99 JOHN STREET.
Providence (R. I.) Store, 131 Dorrance St.
Shipments Upon Receipt of Order from Large Stock of
SEAMLESS DRAWN BRASS AND COPPER TUBING
BRASS { SHEET ROD WIRE COPPER { SHEET ROD WIRE
At Waterbury GERMAN SILVER { SHEET ROD WIRE

NON-CORROSIVE FINEST QUALITY
Copper and Yellow
(MUNTZ) METAL
NAVAL BRASS
NAVAL BRONZE
MANGANESE BRONZE
PLATES, SHEETS, BOLTS, BARS, RODS, NAILS, TACKS, ETC.
Taunton-New Bedford Copper Co.
NEW BEDFORD, MASS.
77 Water Street, New York 61 Batterymarch Street, Boston

C. G. Hussey & Co.
PITTSBURGH, PENNA.
Manufacturers of
COPPER
In Sheets, Plates, Rolls
ANODES
Tacks and Nails

"Bridgeport" Bronze Rod
MANGANESE BRONZE
ALUMINUM BRONZE
PHOSPHOR BRONZE
SILICON BRONZE
Seamless Brass and Copper Tubing
BRAZED BRASS TUBING
SHEET BRASS—SHEET COPPER
GERMAN SILVER—BRASS AND COPPER RODS
BRIDGEPORT BRASS Co.
Manufacturers BRIDGEPORT, CONN.

BRASS and COPPER
in Sheets and Rolls
SILVER PLATED METAL
(for Coach Lamps)
BRITANNIA METAL
B. & M. BABBITT METAL
for Bearings
LINING METAL
for Automobiling Bearings and Copper for Electrical Purposes
H. K. & F. S. Benson
GLEN RIDGE, N. J.

The Seymour Mfg. Co.
SEYMOUR, CONN.
German Silver
Brass, Copper and Bronze in Sheets, Wire, Rods and Tubes
COPPER AND NICKEL ANODES
Phosphor Bronze

A. H. Wells & Co.
WATERBURY, CONN.
Manufacturers of
SEAMLESS . . . NICKEL SILVER, BRASS, COPPER, BRONZE AND PURE COPPER **Tubing**
TUBING FOR ELECTRICAL PURPOSES
Odd and Special Shapes, and Small Tubing a Specialty
——Also the——
BOURDON STEAM GAUGE SPRINGS
All Sizes from 8 to 36, B. & S. Gauge.

THIS SPACE
FOR
SALE
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SEND FOR RATES

MANHATTAN BRASS COMPANY
332 East 28th St., NEW YORK CITY
Manufacturers of
BRASS and BRONZE in Sheet, Rod Wire, Tube, Moulding, etc. METAL GOODS made to order from Brass, Bronze and Copper.

BUFFALO COPPER AND BRASS ROLLING MILL
Military Road and Hertel Avenue
BUFFALO, N. Y.

"RIVERSIDE"
GERMAN SILVER
PHOSPHOR BRONZE
Sheets, Rods, Wire, Ingots, Castings, Jewelers' Bars and Alloys.
The
Riverside Metal Co.
Riverside, Burlington Co., N. J.

DIRECTORY

METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

LEAD AND ZINC SMELTERS AND MANUFACTURERS
PIG LEAD, SPELTFR, SHEET ZINC AND ROD, ACIDS

Matthiessen & Hegeler Zinc Co.
LA SALLE, ILLINOIS
SMELTERS of SPELTER
and Manufacturers of
SHEET ZINC and SULPHURIC ACID
Zincs for Leclanche Battery
Special Sizes of Zinc to order. Rolled Battery Plates. Selected Plates for Etchers' and Lithographers' use. Selected Sheets for Paper and Card Makers' use. Stove and Washboard Blanks.

Horsehead Spelter
THE ORIGINAL BRAND OF PURE SPELTER
Indispensable in the manufacture of
Cartridge Metal, German Silver, Fine Spun Work, Fine Castings, Superior Alloys, &c.

The New Jersey Zinc Co.
National City Bank Bldg.
55 Wall Street, New York

Illinois Zinc Company
Manufacturers of
SPELTER, SHEET ZINC, and SULPHURIC ACID
PERU, ILL.

W. FISHER
Agent, 81 and 83 Fulton Street
New York City
Telephone, 139 Beekman

High-Grade Spelter and Sulphuric Acid

HEGELER BROTHERS, DANVILLE, ILL.

Sandoval Zinc Company
Smelters of
HIGH GRADE SPELTER AND PIG LEAD
Chemical Department
East St. Louis
General Offices:
410 North Peoria Street
CHICAGO, ILLS.
Works: Sandoval and East St. Louis, Illinois.

THIS SPACE FOR SALE

Send for Rates

Cold Rolled Zinc
IN COILS FOR DRAWING and STAMPING
The Platt Bros. & Co.
WATERBURY, CT.

METAL SMELTERS, REFINERS, DEALERS
BUYERS AND SELLERS OF NEW AND OLD METAL

Illinois Smelting & Refining Co.
122 N. Peoria St., Chicago, Ill. Cable Address, "Smelref," Chicago
Manufacturers of
Pig and Bar Lead, Spelter, Babbitt Metals Linotype, Stereotype, Monotype and Electrotype Metal, Yellow Composition and Phosphor Ingots
Dealers in New and Old Metals, and the Largest Buyers of Zinc Dross, Skimmings, Sal Skimmings, Scrap Zinc and Aluminum

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The Morton B. Smith Co.
241 and 243 Front Street, New York

OFFER FOR SALE:
HEAVY COPPER AND WIRE, Ready for the Crucible
COMPOSITION, Carefully Selected
HEAVY YELLOW BRASS, Free from Iron
OLD METALS GENERALLY

S. BIRKENSTEIN & SONS
379-407 W. Ontario Street, Chicago, Ill.
Lake, Electrolytic and Casting Ingot Copper

DIRECTORY

METAL SMELTERS, REFINERS, DEALERS.
BUYERS AND SELLERS OF NEW AND OLD METALS

The Light Manufacturing and Foundry Company

Pottstown, Pa.

Are the Original and only Manufacturers of

AUTOMOBILE BRAND AERIAL BRAND

ALUMINUM CASTINGS

Our Aluminum Castings are especially adapted to Automobile, Auto Boat and Aerial Construction.

LET US BE YOUR FACTORY

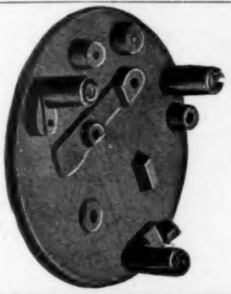
Our plant is equipped with up-to-date machinery, which enables us to turn out articles at the lowest possible cost consistent with good workmanship and best materials.

AUGUST BUERMANN MFG. CO., Newark, N. J.

Manufacturers of "STAR BRAND"

HIGH GRADE BRASS, BRONZE, GERMAN SILVER AND COMPOSITION CASTINGS

For all purposes, Finished or in the rough. To Order and on Contract from Customer's Patterns.



DIE CASTINGS

For all classes of work we can supply Finished Parts more *accurate*, *uniform* and *cheaper* than you can produce them by machinery. Estimates submitted on request.

FINISHED PARTS MANUFACTURING COMPANY

359 MULBERRY STREET, NEWARK, N. J.

CASTINGS

BRASS, BRONZE, ALUMINUM
PHOSPHOR BRONZE
MANGANESE BRONZE

Large castings a specialty, 1000 to 3000 lbs. and up

CLUM & ATKINSON

571 Lyell Avenue ROCHESTER, N. Y.

Brass Founders
Brass Finishers
Electroplaters

Sargeant Manufacturing Co.

NEWARK, N. J.

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are a Ready Reference for Buyers and Sellers. They are classified cards better than the street signs of a business. In no way can you get such good Trade Publicity at so slight a cost.

Rates Furnished for the Asking

THE METAL INDUSTRY, 99 John St., New York

DIRECTORY

METAL FOUNDERS, FINISHERS AND WORKERS

DIRECTORY

METAL ETCHERS, PLATERS AND POLISHERS

NO JOB TOO LARGE OR TOO SMALL FOR US

Northern Ohio Manufacturing and Refinishing Works

B. HENGST, Prop.

GOLD, SILVER, NICKEL PLATING BRONZE AND BRASS

SAFETY RAZORS A SPECIALTY

Repairing of all Kinds of Metal Goods, also Lamps and Chandeliers

2069 EAST 4th STREET CLEVELAND, OHIO

MAX SCHWEIZER

230 North Ave.
BRIDGEPORT, CONN.

PRACTICAL ETCHER

— on —

Silverware, Knives, Scissors, Hardware, Signs, Clock Dials, Name and Embossing Plates, &c.

If You are An
Etcher, Plater or Polisher
Why Not
Let It Be Known

Metal Polishing and Electro Plating

We Cast and Finish Anything in Metal

AMERICAN TOY & NOVELTY MFG. CO.

214 W. INDIANA STREET CHICAGO, ILL.

THIS SPACE FOR SALE

SEND FOR RATES

BOOKS ON MACHINERY
BOOKS ON METALS
BOOKS ON PLATING

ARTICLES ON ALL RELATED SUBJECTS

See Page 50

THE METAL INDUSTRY, - 99 John Street, NEW YORK

Bound Volumes

Bound Volumes of The Metal Industry for 1910 Are Now Ready—Price, $2.00.

The files of 1909 are still in stock.

We have also a limited number of bound files for the years 1907 and 1908.

These bound volumes comprise a library of valuable **Metallurgical, Mechanical** and **Chemical** information, and each volume is thoroughly indexed and nicely bound. There are 175 shop problems, or questions and answers in each volume.

THE METAL INDUSTRY, 99 John Street, New York

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

FOR SALE—A BUSINESS

The rights, title and patents of a TURRET LATHE TOOL.

The tool is now on the market and is in use in 50 different brass shops and there is opportunity for a far greater sale.

The outfit is complete with patterns and jigs and some finished stock.

It is a very good opportunity for a manufacturing tool maker who desires to add to his line of tools.

The owner cannot devote the necessary time to push the business.

For further particulars address BUSINESS, Care

THE METAL INDUSTRY 99 John Street New York.

FOR SALE

METALS, MACHINERY AND SUPPLIES

—:PATENTED PYROPHORIC:—

AUERMETALL

For Igniting and Lighting

USED IN DEVICES DEPENDING ON A FRICTION SPARK

Circular Price-List Furnished on Request

Treibacher Chemical Works

210 East 23d Street, New York City

FOR SALE

Ingot Brass : Spelter : Pig Lead

M. I. WALSH'S SONS & CO., NEWARK, N. J.

Old Material of all Kinds Purchased

FOR SALE—A process of Casting Pure Aluminum from the heaviest to the finest work without cracking. The perfection of this process will be satisfactorily demonstrated. Address, ALUMINUM PROCESS, care THE METAL INDUSTRY.

FOR SALE—Dings No. 2, Type M. Electro Mag. Separator (second hand) for 110 or 220 volts D. C. Good as new. Cost $260. Price $200. J. W. PAXSON CO., Philadelphia, Pa.

FOR SALE—A GOOD ELECTROPLATING BUSINESS AND EQUIPMENT located in a city of 80,000 having no other job shop. Well equipped for nickel, copper and brass plating. Has 15 h. p. 2-cyl. Nash gas engines, large plating dynamo and 40 amp. lighting plant. Good field for a large business. A snap for the right party. Address THE BRENNER PLATING WORKS, Youngstown, Ohio.

FOR SALE—A one hundred and five horsepower OTTO gas producer engine. Erected less than one year ago. In excellent operating condition and more fit than when erected. THOMAS A. PAINTER, 79 Eighth avenue, New York City.

J. P. FANNING, machinist, 678 Jefferson avenue, Brooklyn, N. Y.—Maker of Moulds for Casting Solder, Babbitt Metal, Bar Lead, etc. We also manufacture small work. Write for particulars.

BOOK

Foundry foremen and managers wishing to know the secrets of metal mixing, also cost and loss system, send for the book "THE METAL MIXER," written by an expert. Price, $1.00. Address, A. DEVINE, 121 E. Patterson Avenue, Columbus, Ohio.

FOR SALE

PLANTS—FOR SALE AND TO LET

TO LET—BRASS FOUNDRY in BROOKLYN, fully equipped; tilting and crucible furnaces, molding machine, etc. Location advantageous to down-town trade. Apply 30 ROSE STREET, NEW YORK.

FOR SALE OR LEASE—BRASS AND ALUMINUM FOUNDRY in Indianapolis, Ind. Thoroughly modern in equipment and appliances. Did a business in its last year of nearly $200,000.00. Second largest automobile center in United States. Nearly thirty auto factories in city and vicinity. Great quantities of brass and aluminum castings required here and within a radius of one hundred miles. Present owner engaged in other business requiring his time. Address F. E. JANES, care F. E. JANES COAL & GRAIN COMPANY, INDIANAPOLIS, IND.

FOR SALE.—BRASS FOUNDRY in Brooklyn, N. Y., fully equipped and running at the present time. Good line of paying business. Owner engaged in other business requiring his time. Address X Y Z, care THE METAL INDUSTRY.

FOR SALE—PLATING and POLISHING SHOP, the only one in city. At the present time doing good business. Reason for selling, other business. Cheap to quick buyer. Address PLATING SHOP, care THE METAL INDUSTRY.

FOR SALE—A fully equipped ELECTRO-PLATING PLANT in large western city. Established four years. Profits from $175 to $200 per month. Price $2,000 if taken at once. Terms $1,200 down, balance to suit buyer. Reason for selling, death of owner. Address H. B. B., care THE METAL INDUSTRY.

FOR SALE—ELECTRO-PLATING PLANT doing a good business in the heart of the city of Boston. Good reasons for selling. WINTHROP PLATING COMPANY, 34 Beach street, Boston, Mass.

FOR SALE—Good paying BRASS MANUFACTURING ORNAMENTAL METAL and PLATING WORKS; fully equipped; long lease; cheap rent; established thirty years; wants to sell on account of sickness; will sacrifice for $9,000, at least half cash. Address BOX 1, care THE METAL INDUSTRY.

WANTED

METALS, MACHINERY AND SUPPLIES

WANTED—SECOND-HAND HYDRAULIC PRESS for making wire solder. Address BOX 105, care THE METAL INDUSTRY.

WANTED—A 10 h. p. UPRIGHT BOILER. Must be in good condition and at low cost. Address S-1, care THE METAL INDUSTRY.

WANTED—Second-hand 6 or 8 h. p. horizontal engine and boiler. State what make, condition and price. Address HORIZONTAL, care THE METAL INDUSTRY.

WANTED—A copy of THE METAL INDUSTRY for February, 1905. Address FEBRUARY, care THE METAL INDUSTRY.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

BUSINESS OPPORTUNITIES

INQUIRIES

Inquiries received by The Metal Industry for Metals, Machinery and Supplies. Further particulars may be obtained by addressing the inquiry number, care The Metal Industry. No charge for inserting these inquiries.

Inquiry No. 316—We would like to correspond with the manufacturers of brass bindings folded, brass to be supplied in from 18 to 25 gage thickness.

Inquiry No. 317—We would like to correspond with the manufacturers of welded tanks.

Inquiry No. 318—We would like to correspond with the manufacturers of wire brush wheels used in the making of brushed brass finish on chandeliers.

Inquiry No. 319—We would like to correspond with the manufacturers of drawn brass tube with cold rolled steel center.

Inquiry No. 320—We would like to correspond with firms who do metal etching, etc., by mechanical process.

Inquiry No. 321—We would like to correspond with firms making automatic plating equipment. We wish to plate hollow-ware articles which run to large sizes and must be handled singly. This is not done by the tumbling barrel process.

Inquiry No. 322—We would like to correspond with the manufacturers of electro-plating generators.

Inquiry No. 323—We would like to correspond with the manufacturers of Carboy inclinator, solution skimmer and red copper compound.

Inquiry No. 324—We would like to correspond with the manufacturers of electric steel castings.

Inquiry No. 325—We would like to correspond with firms who can make aluminum castings in lots of 20,000 or 25,000.

Inquiry No. 326—We are in the market for a wire solder machine and would like to hear from manufacturers.

Inquiry No. 327—We would like to correspond with the manufacturers of water-cooled molds for melting babbitt metal.

Inquiry No. 328—We would like to correspond with the manufacturers of the Triplex polishing buffs.

Inquiry No. 329—We would like to correspond with the manufacturers of sand blasts for glass.

Inquiry No. 330—We would like to correspond with the manufacturers of iron drums, holding about 100 pounds.

SITUATIONS OPEN

ROLLING MILL EXPERTS

WANTED—Consulting Copper Mill Expert to visit plant and advise regarding operative methods. Address CONSULTING, care The Metal Industry.

WANTED—A capable young man under thirty-five, to supervise SHEET ROLLING DEPARTMENT of well-established industry. Technical graduate preferred. Address SUPERVISOR, care The Metal Industry.

WANTED—MANAGING SUPERINTENDENT to take charge of a ROLLING MILL manufacturing COPPER AND BRASS SHEETS, TUBES and RODS. This job offers a splendid opportunity for a competent man. For particulars, apply J. F. BROWN, 185 Yonge street, Toronto, Ont., Canada.

SITUATIONS OPEN—Continued

SALESMEN

WANTED—SALESMAN to sell throughout New England a well-established machine made by an old reliable company and used in the plating, textile and other trades. A good opening for a reliable man. Address NEW ENGLAND, care The Metal Industry.

WANTED—An experienced SALESMAN with an established trade to sell several well-known grades of BABBITT METALS; territory unlimited. Address M-7, care The Metal Industry.

SMELTER AND ASSAYER

WANTED—A good man who is thoroughly conversant in both electrolytic and general smelting and assaying. A good opening for such a man. Address ELECTROLYTIC, care The Metal Industry.

FOUNDERS

WANTED—A first-class BRASS FOUNDRY FOREMAN to take charge of a new MODERN BRASS FOUNDRY making a full line of Steam and Water Goods. Foundry equipped with Sand Handling Machinery, Molding Machines and Schwartz Melting Furnaces. Factory located in Western Pennsylvania. State age and experience. Address MODERN BRASS, care The Metal Industry.

DIE CASTER

WANTED—A MANAGING SUPERINTENDENT capable of taking complete charge of a DIE CASTING PLANT in CANADA, preferably one who can become interested financially and act as director. Address CANADA MANAGER, care The Metal Industry.

ELECTRO GALVANIZER

WANTED—ELECTRO GALVANIZER—An absolutely reliable, experienced and steady man to act as foreman and work on tanks; one not afraid of work. Wages must be moderate to start, but unusual prospects and permanent position to the right man. In answering give full particulars as to experience, wages wanted, etc. Address ELECTRO-GALVANIZER, care The Metal Industry.

PLATERS AND POLISHERS

WANTED—Foreman for Plating Works, one who understands the Mechanical Electro-Plating Machines. Fine chance for the right man. Give age, experience and wages wanted. All answers kept confidential. Address "FOREMAN," care The Metal Industry.

WANTED—A man who knows every branch of plating and can take charge of plant. Will pay a good salary to the right man. None but good men need apply. WESTLAND JEWELRY AND PLATING COMPANY, 1209 Houston street, Ft. Worth, Texas.

WANTED—POLISHER. Must know how to get a good gray finish on sterling silverware, such as mirrors, hair brushes, etc. Good position for the right man. SCHMITZ, MOORE & CO., 407 Mulberry street, Newark, N. J.

SITUATIONS WANTED

Advertisements Under This Heading 50 Cents Each Insertion.

EXECUTIVE

SITUATION WANTED—I am desirous of making a change in September. For the past four years I have been GENERAL MANAGER of a leading plant making PLUMBING SUPPLIES and previous seven years general office and factory experience. Age 31, married, active, energetic and thoroughly capable. Correspondence solicited and references exchanged. Address, PLUMBING MANAGER, care The Metal Industry.

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES
Advertisements will be inserted under this head at 40 cents per line, 3 lines one dollar, for each insertion, excepting Situations Wanted, which are 50 cents each insertion. Answers sent in our care will be forwarded

SITUATIONS WANTED—Continued

Advertisements Under This Heading 50 Cents Each Insertion

EXECUTIVE—Continued

SITUATION WANTED—Open for position on July 15th, a thorough factory man of 18 years' experience in the manufacturing of brass goods, with modern methods, up-to-date on system, economical tool design and equipment, cost of production, etc. Correspondence invited. Address FACTORY MAN, care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY SUPERINTENDENT or FOREMAN. Thoroughly experienced on ALUMINUM CASTINGS for automobiles, valve, pump and general jobbing lines. Thirty-two years old, temperate and a hustler. Well up on molding machines and mixing metals. Address 0-2, care THE METAL INDUSTRY.

SITUATION WANTED—Position as MANAGER or SUPERINTENDENT with concern manufacturing BRASS GOODS. Technical graduate, married, sober, industrious and energetic, 30 years old, experienced on PLUMBERS' BRASS GOODS, BUILDERS' HARDWARE, etc.; INTERCHANGEABLE PARTS, modern methods, executive, cost accountant. References. Address R., care THE METAL INDUSTRY.

PROFESSIONAL

SITUATION WANTED—By technical trained METALLURGIST, graduate of Eastern university; several years' practice in large galvanizing works. Would like to engage with galvanizing or sherardizing firm. Best of references. Address UNIVERSITY, care THE METAL INDUSTRY.

SITUATION WANTED—By a practical STEAM and ELECTRICAL ENGINEER, 2nd class N. Y. license; wishes steady employment. Holding a responsible position for the last 8 years with a large modern electrical plant. Good reference; capable of taking charge. Address T. S., care THE METAL INDUSTRY.

SALESMAN

SITUATION WANTED—AS SALESMAN in New York or western territory with manufacturer of brass and copper goods, sheet, rod, wire and tubing. Have had 8 years' experience and wide acquaintance with trade. Address BOX 106, care THE METAL INDUSTRY.

ROD ROLLER

SITUATION WANTED—As ROD ROLLER in Brass Rod Mill. Have had charge of a rod mill for years. Can furnish the best of reference. Address ROD ROLLER, care THE METAL INDUSTRY.

PATTERN MAKER

SITUATION WANTED—FOREMAN METAL PATTERN MAKER experienced on steam specialties and plumbers' brass goods, also the manufacture of general brass goods. Address B, care THE METAL INDUSTRY.

FOUNDERS

SITUATION WANTED—By a BRASS FOUNDRYMAN. Can do my own mixing, handle crucible or oil furnaces. Can control help to good advantage. Can offer a good proposition if you are in need of such a man. Address, BRASS FOUNDRYMAN, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLASTER COMPOSITION FOUNDRYMAN with 9 years' experience at fine arts castings in metals, plaster, wax and glue; also for patterns for engraving machines. Address P. C. F., care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY FOREMAN desires a position in a foundry just starting. Can give best results in machine moldings and furnaces. Can look after the making up of patterns to see that they give good results in molding and finishing. Can mix metals for any work desired, enabling you to meet all competitors. Address, M. B., care THE METAL INDUSTRY.

FOUNDERS—Continued

SITUATION WANTED—WORKING BRASS FOUNDRY FOREMAN, all round man. Brass, Bronze and Aluminum. Understands machines; good mixer and melter. Age 50. Sober and steady. Address J-26, care THE METAL INDUSTRY.

SITUATION WANTED—By ALUMINUM FLOOR MOLDER thoroughly familiar with heavy and light work. Have had 19 years' experience. Address N. J., care THE METAL INDUSTRY.

BRASS FINISHER

SITUATION WANTED—FOREMAN BRASS FINISHER, thoroughly familiar with the latest methods of manufacturing steamfitters' and plumbers' supplies, also specialty and jobbing; 18 years' experience. Best references. Address M-1, care THE METAL INDUSTRY.

SPINNER

SITUATION WANTED—SPINNER, 44 years old, with many years' experiene on round and oval work in silver, aluminum, brass, copper, etc., wishes position. Address J-22, care THE METAL INDUSTRY.

ETCHER

SITUATION WANTED—Thoroughly practical transfer etcher on silver, brass, copper and organic substances, desires to make a change. Good recommendations. Address X. T., care THE METAL INDUSTRY.

GALVANIZER

SITUATION WANTED—By an expert GALVANIZER. Specialty is conduit pipes, also the making of one of the best black enamels for conduit pipes. Address, CONDUIT, care THE METAL INDUSTRY.

PLATERS AND POLISHERS

ELECTROPLATERS

Any one desiring the services of first class men for the electro-deposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the National Electro-Platers' Association, Royal F. Clark, 246 Fulton Street, Jersey City, N. J.

SITUATION WANTED—By a PLATER with 15 years' experience in polishing, buffing and plating. Have been foreman three different times in plating Brass, Copper, Bronze, Nickel, Oxidizing, Galvanizing, etc. Can furnish good references. Address J-24, care THE METAL INDUSTRY.

SITUATION WANTED—I would like to correspond with a firm who desires the services of a good, reliable plater. Would prefer position in New York City or vicinity. Address J-25, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER with several years' experience on Nickel, Brass, Copper, Bronze Solutions, oxidizing and dipping. Address J-23, care THE METAL INDUSTRY.

SITUATION WANTED—PLATER, BUFFER and POLISHER wants position in New York City or vicinity. Had 20 years' experience, including a job shop of my own. Plate in copper, brass, nickel, bronze, silver, gold, platinum, zinc and tin. Make all chandelier, hardware and art metal finishes. A place starting their own plating preferred. Can install economic and efficient system. BOX 239, TOLEDO, OHIO.

TRADE WANTS

AN EXCHANGE FOR THE WANTS OF THE METAL TRADES

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SITUATIONS WANTED—Continued

Advertisements Under This Heading 50 Cents Each Insertion

PLATERS AND POLISHERS—Continued

SITUATION WANTED—SILVER AND GOLD PLATER desires a position as FOREMAN. Have had 12 years' experience and am well versed in chemistry. Address, ELECTRO, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER of 12 years' experience. Thoroughly familiar with all finishes. Address, L. J., care THE METAL INDUSTRY.

SITUATION WANTED—Expert up-to-date NOVELTY ELECTRO-PLATER who has run the largest jewelry plant in the East. Address BOX 101, care THE METAL INDUSTRY.

SITUATION WANTED—EXPERT PLATER and POLISHER as FOREMAN with a reliable firm. Can handle help to very good advantage. Up-to-date on all finishes in a very economical manner. Would begin at a moderate salary. Age 38, married. Can furnish the best of reference. Address, N. LEVY, 227 Hampshire street, Cambridge, Mass.

SITUATION WANTED—By an ELECTRO-PLATER, 18 years' experience with Nickel, Copper, Brass and Bronze solutions and oxidizing. Can furnish good reference. Address BOX M-9, care THE METAL INDUSTRY.

SITUATION WANTED—PLATER, expert on all finishes in GOLD, SILVER, NICKEL, COPPER, BRASS OXIDIZING, BRONZING, etc. on fancy metal goods. Can do work in the cheapest way. Also expert on solid gold and silver. Understands the making of all solutions. Can install plating department, if necessary, and take charge. Have had 10 years' experience. Can furnish references to any firm offering a steady position. If references are required give full details of position in first letter. Address, PLATER, care Weiner, 398 Grand street, New York City.

SITUATION WANTED—By a FOREMAN-PLATER who thoroughly understands the plating business from A to Z. Has had several years' experience and is capable of taking charge. Address P. H., care THE METAL INDUSTRY.

SITUATION WANTED—By a GILDER EXPERT on shades of GOLD COLORING. Age 35. Position in Newark or New York City preferred. Address JEWELRY, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER. First-class man on nickel, brass, copper, silver, black nickel; understands all hardware finishes, etc. Address N-2, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who is up to date on all finishes and colors. Desires a position with a good firm. Salary $30 per week. Address D-1, care THE METAL INDUSTRY.

SITUATION WANTED—By ELECTRO-PLATER with over 20 years' experience. Thoroughly understands all branches of plating, dipping, bronzing, etc. Address A-2, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER having had ten years' experience on all metals and finishes. Can furnish best of reference. Address CONNECTICUT, care THE METAL INDUSTRY.

SITUATION WANTED—Position as ELECTRO-GILDER and PLATER. Expert worker in jobbing, gilding and plating. Address JOB GILDER, care THE METAL INDUSTRY.

SITUATION WANTED.—A POLISHER and PLATER wishes to change; can take full charge of the finishing end. No place too large. Total abstainer. Good references. Address F. J. H., care THE METAL INDUSTRY.

WANTED—To correspond with a MR. ZEIDMAN who we understand is employed in a polishing or plating plant in New York City or vicinity. Address BOX 107, care THE METAL INDUSTRY.

CLASSIFIED INDEX OF ADVERTISEMENTS AND BUYERS' GUIDE

Accumulators, Hydraulic
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Acid, Hydrofluoric (See also Platers' Supplies).
General Chemical Co., Philadelphia, Pa.
Kalbfleisch, Franklin H., Co., New York.
McKesson & Robbins, New York.

Acid, Muriatic (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.
Niagara Alkali Co., Niagara Falls, N. Y.

Acid, Sulphuric (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.
Illinois Zinc Co., Peru, Ill.
Kalbfleisch, Franklin H., Co., New York.
Matthiessen & Hegeler Zinc Co., La Salle, Ill.
McKesson & Robbins, New York.

Air Compressors.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Nicholls, W. H., New York.
Pangborn, Thomas W., Company, New York.

Air Filters.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.

Alloys Made to Specifications.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Birkenstein, S., & Sons, Chicago, Ill.
Clum & Atkinson, Rochester, N. Y.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Genessee Metal Co., Rochester, N. Y.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Aluminum Bronze Ingots.
Electric Smelting & Alum'n Co., Lockport, N. Y.

Aluminum Castings.
Aluminum Company of America, Pittsburg, Pa.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Buermann, August, Newark, N. J.
Clum & Atkinson, Rochester, N. Y.
Light Foundry & Mfg. Co., Pottstown, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.

Aluminum Electrical Conductors.
Aluminum Company of America, Pittsburg, Pa.

Aluminum, Granulated
U. S. Reduction Co., Chicago, Ill.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Aluminum Ingots.
Aluminum Company of America, Pittsburg, Pa.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Gulterman, Rosenfeld & Co., New York.
Kemp, W. H., Co., New York.
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Aluminum Match Plates.
McPhee, Hugh, Tarrytown, N. Y.

Aluminum Powder, Leaf and Foil.
Kemp, W. H., Co., New York.

Aluminum Manufactured Goods, Sheet
Aluminum Goods Mfg. Co., Manitowoc, Wis.
(See also Metal Goods made to order).

Aluminum Moldings and Extruded Shapes.
Aluminum Co. of America, Pittsburg, Pa.

Aluminum Rivets.
Hassall, John, Inc., Brooklyn, N. Y.
Kemp, W. H., Co., New York.

Aluminum Sheets, Rods and Wire.
Aluminum Company of America, Pittsburg, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Kemp, W. H., Co., New York.
Pilling Brass Co., Waterbury, Conn.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Aluminum Solder (See Solder).

Aluminum Tubes.
Aluminum Company of America, Pittsburg, Pa.
Ellwood Ivins Tube Works, Philadelphia, Pa.
Kemp, W. H., Co., New York.

Ammeters and Voltmeters (See also Platers' Supplies).
Bristol Co., The, Waterbury, Conn.
Sangamo Electric Co., Springfield, Ill.

Amyl Acetate (See also Platers' Supplies).
McKesson & Robbins, New York.
Nickolas, G. J., & Co., Chicago, Ill.

Annealing Machines, Automatic
Bates & Peard Annealing Furnace Co., New York.

Anodes, Brass or Copper (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hanson & Van Winkle Co., Newark, N. J.
Hussey, C. G., & Co., Pittsburg, Pa.
Seymour Manufacturing Co., The, Seymour, Conn.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Anodes, Nickel (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hanson & Van Winkle Co., Newark, N. J.
McKesson & Robbins, New York.
Seymour Manufacturing Co., The, Seymour, Conn.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Anodes, Platinum (See also Platers' Supplies).
Bishop, J., & Co., Malvern, Pa.

Anodes, Silver (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Jackson, John J., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.

Anodes, Zinc (See also Platers' Supplies).
Grasselli Chemical Co., Cleveland, O.

Antimony Metal.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
U. S. Reduction Co., Chicago, Ill.

Assayers (See Chemists and Assayers).

Automatic Cock Grinder.
Turner Machine Co., Philadelphia, Pa.

Babbitt Metals.
American Manganese Bronze Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Benson, H. K. & F. S., Glen Ridge, N. J.
Birkenstein, S. & Sons, Chicago, Ill.
Clum & Atkinson, Rochester, N. Y.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.

Balls, Steel, for Burnishing
Abbott Ball Co., Hartford, Conn.
Globe Machine & Stamping Co., Cleveland, O.

Bismuth.
Hendricks Brothers, New York.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.

Block Tin (See Tin).

Block Tin Pipe.
North American Smelting Co., Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Blow Piping.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cincinnati, O.
Knickerbocker Company, Jackson, Mich.

Brass and Bronze Architectural Work.
Manhattan Brass Co., New York.

Brass and Bronze Covered Iron Tubes.
Phenix Tube Co., Brooklyn, N. Y.

Brass Castings.
American Manganese Bronze Co., New York.
Buermann, August, Newark, N. J.
Clum & Atkinson, Rochester, N. Y.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Sargent Mfg. Co., Newark, N. J.

Brass Ingots.
American Manganese Bronze Co., New York.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Genessee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Brass, Bronze or Copper Sheet, Wire, Rod, Etc.
American Manganese Bronze Co., New York.
Ansonia Brass & Copper Co., The, New York.
Benson, H. K. & F. S., Glen Ridge, N. J.
Bridgeport Brass Co., Bridgeport, Conn.
Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y.
Hendricks Bros., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Manhattan Brass Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Taunton-New B'fd Copper Co., New Bedford, Mass.
Waterbury Brass Co., Waterbury, Conn.

Brass, Bronze or Copper Tubes.
Ansonia Brass & Copper Co., The, New York.
Bridgeport Brass Co., Bridgeport, Conn.
Buffalo Copper & Brass Rolling Mill, Buffalo, N. Y.
Ellwood Ivins Tube Works, Philadelphia, Pa.
Linton & Co., Providence, R. I.
Manhattan Brass Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Phenix Tube Co., Brooklyn, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.
Wells, A. H., Co., Waterbury, Conn.

Brass Goods, Plumbers'
Manhattan Brass Co., New York.

Brazing—Brass, Iron, Etc.
Morgan Manufacturing Co., Newport, R. I.

Britannia Metal.
Benson, H. K. & F. S., Glen Ridge, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Bronze Castings.
Buermann, August, Newark, N. J.

Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Ansonia Brass & Copper Co., The, New York.
Clum & Atkinson, Rochester, N. Y.
Genesee Metal Co., Rochester, N. Y.
Naulty Smelting & Ref'g Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Bronze Sheets, Wire, Rods, Etc. (See Brass, Bronze and Copper Sheets, etc.).

Bronze Tubes (See Brass, Bronze and Copper Tubes).

Brushes, Wire and Bristle (See also Foundry Supplies and Platers' Supplies).
Blumenthal, Hermann, New York.
Osborn Manufacturing Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Riehl Manufacturing Co., Cleveland, O.

Buckle Tongues.
Campbell-Warner Co., Middletown, Conn.

Buffing Compositions (See also Platers' Supplies).
American Tripoli Co., Seneca, Mo.

Buffing and Polishing Supplies (See Polishing and Buffing Machinery and Equipment).

Buffing and Polishing Wheels (See also Platers' Supplies).
Divine Brothers Co., Utica, N. Y.

Bull-Dozers
Wood, R. D., & Co., Philadelphia, Pa.

Burners, Fuel Oil or Gas (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Company, New York.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Burnishing Barrels (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Oakville, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.

Burnishing Barrels, Leather Meal for
Peckham Mfg. Co., Newark, N. J.

Cabbaging Presses.
Farrel Foundry & Machine Co., Ansonia, Conn.
Wood, R. D., & Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Cadmium, Metallic
Grasselli Chemical Co., Cleveland, O.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Richards & Co., Boston, Mass.

Castings. (See also name of metal wanted).

Castings, Die
Finished Parts Mfg. Co., Newark, N. J.

Castings, Iron Machinery
Bliss Co., E. W., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Centrifugal Dryers and Extractors
Tolhurst Machine Works, Troy, N. Y.

Chaplets, Perforated
Hill & Griffith Co., Cincinnati, O.

Chemicals (See Platers' Supplies).

Chemists and Assayers.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.
McKesson & Robbins, New York.
Renziehausen, Wm. F., Newark, N. J.

Chemists, Manufacturing
Grasselli Chemical Co., Cleveland, O.
International Chemical Co., Camden, N. J.
Klipstein, A., & Co., New York.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.
Roessler & Hasslacher Chemical Co., New York.
Swan & Finch Co., New York.

Chromium Bronze.
Naulty Smelting & Refining Co., Philadelphia, Pa.

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Chucks, Spinning
Bliss, E. W., Co., Brooklyn, N. Y.
Prylbil, P., New York.

Cock Grinder, Automatic
Turner Machine Co., Philadelphia, Pa.

Composition Metal Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Buermann, August, Newark, N. J.
Eastern Metal & Refining Co., Boston, Mass.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
White & Bro., Inc., Philadelphia, Pa.

Composition Metal Tacks, Nails, Etc.
Hussey, C. G., & Co., Pittsburg, Pa.

Conveyors.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Copper, Carbonate of
Detroit Foundry Supply Co., Detroit, Mich.

Copper Castings.
American Manganese Bronze Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.

Copper Ingots.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Brothers, New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Taunton-New B'fd Copper Co., New Bedford, Mass.
Vogelstein, L., & Co., New York.
White & Bro., Inc., Philadelphia, Pa.

Copper Nails and Tacks.
Hassall, John, Inc., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Copper Rivets.
Hassall, John, Inc., New York.
Hendricks Bros., New York.

Copper Sheets, Wire, Rods, Bolts, Etc. (See Brass and Copper Sheets, etc.).

Copper, Shot
Seymour Manufacturing Co., Seymour, Conn.

Copper, Sulphate of
Grasselli Chemical Co., Cleveland, O.

Copper Tubes (See Brass and Copper Tubes).

Core Compound (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hill & Griffith Co., Cincinnati, O.
Paxson, J. W., Co., Philadelphia, Pa.

Core Machines (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, W. H., New York.
Pangborn, Thomas W., Company, New York.

Core Ovens (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Gehnrich, Hermann, New York.
Hill & Griffith Co., Cincinnati, O.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Smith, J. D., Foundry & Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Core Tapering Machines (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.

Cranes.
Detroit Foundry Supply Co., Detroit, Mich.

Crucibles, Platinum
Bishop, J., & Co., Malvern, Pa.

Crucibles, Stirrers, Stoppers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburg, Pa.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Taylor, R. J., Inc., Philadelphia, Pa.

Crushers, Cinder (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Farrel Foundry & Machine Co., Ansonia, Conn.
Moussette, O. J., Co., Brooklyn, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Cupror Metal.
Cupror Co., The, New York.

Cyanide of Potassium (See also Platers' Supplies).
McKesson & Robbins, New York.

Die-Castings.
Finished Parts Mfg. Co., Newark, N. J.

Dies, Sheet Metal Working
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Globe Machine Stamping Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Draw Benches—Wire, Rod and Tube
Farrel Foundry & Machine Co., Ansonia, Conn.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Drosses (See Metal Turnings, Drosses, etc.).

Drying-Out Machines.
Baird Machine Co., Oakville, Conn.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Dust Collectors and Ventilating Systems.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., The, Jackson, Mich.
Pangborn, Thomas W., Company, New York.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Backus & Lesser Co., New York.
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Canning, W. Co., Birmingham, England.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, C. L., & Sons, Chicago, Ill.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Electric Cleaning Compounds (See Metal Cleaning Compounds).

Electrodiators' Centrifugal Dryers
Tolhurst Machine Works, Troy, N. Y.

Electroplating, Polishing, Coloring, Etc.
American Toy & Novelty Co., Chicago, Ill.
Blue Ridge Metal Mfg. Co., Susquehanna, Pa.
Buermann, August, Newark, N. J.
Northern Ohio Mfg. & Refg. Works, Cleveland, O.
Sargeant Mfg. Co., Newark, N. J.

Emery (See Platers' Supplies).

Emery Wheels (See Grinding Machinery, etc.)

Enameling Ovens.
Gehnrich, Herrmann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Engineers, Mechanical, Foundry, Etc.
Pangborn, Thomas W., Company, New York.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Thompson, Hugh L., Waterbury, Conn.

Escutcheon Pins, All Metals
Hassall, John, New York.

Etched Name Plates.
Schweizer, Max, Bridgeport, Conn.

Exhaust Fans.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Lederer, F. J., Co., Buffalo, N. Y.
Pangborn, Thomas W., Company, New York.

Expert Instruction—Plating, Coloring, Dipping, Etching, Etc.
Proctor & Stremel, Arlington, N. J.
Schweizer, Max, Bridgeport, Conn.

Extractors, Centrifugal Drying
Tolhurst Machine Works, Troy, N. Y.

Fire Brick (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.

Flasks, Brass Molders' (See also Foundry Supplies).
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.
Nicholls, W. H., New York.
Osborn Mfg. Co., Cleveland, O.
Sterling Wheelbarrow Co., West Allis, Wis.

Fluxes, Metal (See also Foundry Supplies).
Hill & Griffith Co., Cincinnati, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Uranium Co. of America, Buffalo, N. Y.

Fluxes, Soldering and Tinning
Grasselli Chemical Co., Cleveland, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Spice, The Alfred, Process, Philadelphia, Pa.

Forgings, Automobile
American Manganese Bronze Co., New York.
Bliss, E. W., Co., Brooklyn, N. Y.

Foundry Facings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Hill & Griffith Co., Cincinnati, O.
McKesson & Robbins, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Foundry Supplies and Equipment.
Birkenstein, S., & Sons, Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hawley Down Draft Furnace Co., Chicago, Ill.
Hill & Griffith Co., Cincinnati, O.
Kroeschell Bros. Co., Chicago, Ill.
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Obermayer Co., The S., Cincinnati, O.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Sterling Wheelbarrow Co., West Allis, Wis.
Stevens, Frederic B., Detroit, Mich.
Uranium Co. of America, Buffalo, N. Y.

Furnace Linings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Annealing, Brazing, Etc.
Bates & Peard Annealing Furnace Co., New York.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Furnaces, Electric
Bristol Co., The, Waterbury, Conn.

Furnaces, Galvanizing and Tinning
Farrel Foundry & Machine Co., Ansonia, Conn.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Melting, for Oil, Coal, Coke, or Gas. (See also Foundry Supplies).
Chicago Flexible Shaft Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hawley Down Draft Furnace Co., Chicago, Ill.
Ideal Furnace Co., Chester, Pa.
Kroeschell Bros. Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Reverberatory
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Fusel Oil, Refined (See also Platers' Supplies).
McKesson & Robbins, New York.
Nikolas, G. J., & Co., Chicago, Ill.

Galvanized Specialties, Nails, Screws, Etc.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Plants and Equipment. (See also Platers' and Polishers' Supplies).
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Meaker Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Barrels and Automatic Devices.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.
Globe Machine & Stamping Co., Cleveland, O.

Galvanizing for the Trade.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Gas Producers and Power Plants
Wood, R. D., & Co., Philadelphia, Pa.

German Silver Ingots, Castings, Etc.
Buermann, August, Newark, N. J.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.

German Silver Sheets, Wire, Rods, Tubes, Etc.
Pilling Bros. Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.

Gold Alloys.
Riverside Metal Co., Riverside, N. J.

Gold Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Graphite (See Foundry Supplies).

Grinding Machinery.
Bennett-O'Connell Co., Chicago, Ill.
Blake & Johnson Co., Waterbury, Conn.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Osborn Mfg. Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Grinding Wheels (See also Foundry Supplies).
Carborundum Co., Niagara Falls, N. Y.

Heat Gages.
Bristol Co., Waterbury, Conn.

Hoists, Electric, Pneumatic, Hand
Detroit Foundry Supply Co., Detroit, Mich.

Hydraulic Accumulators.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Hydraulic Machinery, Presses, Jacks, Etc.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Iron, Scrap, Dealers in
Smith, The Morton B., New York.

Iron Tubes, Brass and Bronze Covered
Phoenix Tube Co., Brooklyn, N. Y.

Japanning Ovens.
Gehnrich, Hermann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

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Jewelers' Equipment and Supplies (See also Plater's Supplies).
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Tolhurst Machine Works, Troy, N. Y.

Jewelers' Findings.
Smith & Richardson, Attleboro, Mass.

Kettles, Galvanizing and Tinning (See also Platers' Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.

Lacquer Enamels. (See also Platers' Supplies).
Celluloid Zapon Co., New York.
Egyptian Lacquer Mfg. Co., New York.
Eureka Pneumatic Spray Co., New York.
Hanson & Van Winkle Co., Newark, N. J.

Lacquering Ovens.
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Lacquer Sprayers.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Paasche Air Brush Co., Chicago, Ill.

Lacquers, Metal (See also Platers' Supplies).
American Lacquer Co., Bridgeport, Conn.
Celluloid Zapon Co., New York.
Egyptian Lacquer Manufacturing Co., New York.
Eureka Pneumatic Spray Co., New York.
General Bakelite Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.
New Era Lustre Co., New Haven, Conn.
Nikolas, G. J., & Co., Chicago, Ill.

Ladle Heaters and Dryers (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.

Ladles (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.

Lathes, Polishing (See Platers' and Polishers' Supplies).

Lathes, Spinning, Turning, Etc.
American Tool & Machine Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Pryibil, P., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Lathes, Turret
American Tool & Machine Co., Boston, Mass.

Lead, Antimonial
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead Castings, Antimonial
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead, Pig and Bar
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.
Vogelstein, L., & Co., New York.

Lead Pipe.
North American Smelting Co., Philadelphia, Pa.

Leather Meal for Dry Tumbling.
Peckham Mfg. Co., Newark, N. J.

Lubricants.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Lycopodium (See also Foundry Supplies).
McKesson & Robbins, New York.

Mahogany Pattern Lumber.
Thompson & Co., Lewis, Philadelphia, Pa.

Manganese Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Clum & Atkinson, Rochester, N. Y.
Electric Smelting & Alum. Co., Lockport, N. Y.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Manganese Bronze Sheets, Rods, Etc.
American Manganese Bronze Co., New York.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Manganese Copper.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelting & Alum. Co., Lockport, N. Y.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Manganese Metal.
Leavitt, C. W., & Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

Magnesium Metal.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Roessler & Hasslacher Chemical Co., New York.

Magnetic Metal Separators (See also Foundry Supplies).
American Concentrator Co., Joplin, Mo.
Capitol Brass Works, Detroit, Mich.
Dings Electro-Mag. Separator Co., Milwaukee, Wis.
Pangborn, Thomas W., Company, New York.

Match Plates.
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.

Metals (See name of metal wanted).

Metal Cleaning Compounds (See also Platers' Supplies).
Anthony, H. M., & Co., New York.
Cleveland Platers' Supply Co., Cleveland, O.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.

Metal Fluxes (See also Foundry Supplies).
Reeves, Paul S., & Son, Philadelphia, Pa.
Uranimite Co. of America, Buffalo, N. Y.

Metallurgists, Consulting,
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.

Metals, Dealers in all Kinds of New (See also name of metal wanted).
Andler, M. M., & Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Moers, Albert A., New York.
Richards & Co., Boston, Mass.

Metals, Dealers in Old
Andler, M. M., & Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Genesee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B., Co., New York.
Riverside Metal Co., Riverside, N. J.

Metals, Dealers in Old—Gold, Silver, Platinum
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Goods Drying Machines
Tolhurst Machine Works, Troy, N. Y.

Metal Goods Made to Order.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
American Toy & Novelty Co., Chicago, Ill.
Ansonia Brass & Copper Co., New York.
Blue Ridge Metal Mfg. Co., Susquehanna, Pa.
Bridgeport Brass Co., Bridgeport, Conn.
Buermann, August, Newark, N. J.
Manhattan Brass Co., New York.
Riverside Metal Co., Riverside, N. J.
Sargeant Mfg. Co., Newark, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Waterbury Brass Co., Waterbury, Conn.

Metal, Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.
National Sheet Metal Co., Peru, Ill.

Metal Refiners, Gold and Silver.
Genesee Metal Co., Rochester, N. Y.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Refiners—White Metal.
Birkenstein, S., & Sons, Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
Reeves, Paul S., & Sons, Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Toothill, John, Rochelle Park, N. J.

Metal, Silver Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.

Metal Spinning. (See also Metal Goods made to order).
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Blue Ridge Metal Mfg. Co., Susquehanna, Pa.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Metal Stamping. (See also Metal Goods made to order).
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Blue Ridge Metal Mfg. Co., Susquehanna, Pa.
Globe Machine & Stamping Co., Cleveland, O.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Metal Turnings, Drosses Residue, Etc., Buyers of
Andler, M. M., Co., Boston, Mass.
Birkenstein, S., & Sons, Chicago, Ill.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B., Co., New York.
Toothill, John, Rochelle Park, N. J.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Mold Dryers, Portable (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.

Mold Spraying Machines. (See also Foundry Supplies).
Pangborn, Thomas W., Company, New York.

Molds, Ingot (See also Foundry Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.
Nicholls, Wm. H., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Molding Machines. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hill & Griffith Co., Cincinnati, O.
McPhee, Hugh, Tarrytown, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

Monel Metal Sheets.
Merchant & Evans Co., Philadelphia, Pa.

Muntz's Metal—Sheets, Rods, Bolts, Nails, Etc
Taunton-New B'fd Copper Co., New Bedford, Mass.

Nails. (See name of metal wanted).

Name Plates, Etched
Schweizer, Max, Bridgeport, Conn.

Nickel.
Hanson & Van Winkle Co., Newark, N. J.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Nickel Castings.
Hanson & Van Winkle Co., Newark, N. J.

Nickel Salts. (See also Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hanson & Van Winkle Co., Newark, N. J.
McKesson & Robbins, New York.

Nickel, Shot
Merchant & Evans Co., Philadelphia, Pa.
Seymour Manufacturing Co., The, Seymour, Conn.

Nickel Silver Tubes.
Wells, A. H., & Co., Waterbury, Conn.

Oil Pumps and Storage Tanks.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Oils, Tempering and Lubricating
McKesson & Robbins, New York.
Swan & Finch, New York.

Ovens. (See also Core, Lacquering, Enameling and Sherardizing Ovens).
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Paint for Metals, Etc.
Woolsey, C. A., Co., Jersey City, N. J.

Parting Compounds. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hill & Griffith Co., Cincinnati, O.
Stevens, Frederic B., Detroit, Mich.

Pattern Lumber, Mahogany
Thompson & Co., Lewis, Philadelphia, Pa.

Pattern Shop Supplies (See Foundry Supplies).

Patterns, Mounted
McPhee, Hugh, Tarrytown, N. Y.

Pewter.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
Clum & Atkinson, Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Bronze Sheets, Wire, Rods, Etc.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Copper.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Phosphor Tin.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Clum & Atkinson, Rochester, N. Y.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.

Phosphorus. (See also Foundry Supplies).
General Chemical Co., Philadelphia, Pa.
McKesson & Robbins, New York.

Pickling Machines, Automatic
Schmitz, August, Dusseldorf, Germany.
Torrington Manufacturing Co., Torrington, Conn.

Platers' Compound. (See also Platers' Supplies).
International Chemical Co., Camden, N. J.
Swan & Finch Co., New York.

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Platers' Metal (See also Platers' Supplies).
Kemp, W. H., New York.
Pilling Brass Co., Waterbury, Conn.

Platers', Polishers' and Galvanizers' Equipment and Supplies.
Abbott Ball Co., Hartford, Conn.
Anthony, H. M., Co., New York.
Automatic Buffing Machine Co., Buffalo, N. Y.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Burns, E. Reed, Brooklyn, N. Y.
Canning, W., & Co., Birmingham, England.
Cleveland Platers' Supply Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
General Bakelite Co., New York.
Globe Machine & Stamping Co., Cleveland, O.
Grasselli Chemical Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Meaker Company, Chicago, Ill.
McKesson & Robbins, New York.
Moyer, D. B., Walled Lake, Mich.
Peckham Mfg. Co., Newark, N. J.
Roessler & Hasslacher Chemical Co., New York.
Rockhill & Vietor, New York.
Roth Bros. Co., Chicago, Ill.
Smith & Richardson, Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.
Tolhurst Machine Works, Troy, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Plating Barrels and Apparatus.
(See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, C. F., & Sons Co., Chicago, Ill.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
Rockhill & Vietor, New York.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Platinum Alloys, Salts, Solutions.
Bishop, J., & Co., Malvern, Pa.

Platinum Ingots.
Gulterman, Rosenfeld & Co., New York.

Platinum Laboratory Ware.
Bishop, J., & Co., Malvern, Pa.

Platinum Manufactured Goods.
Bishop, J., & Co., Malvern, Pa.

Platinum Refiners.
Bishop, J., & Co., Malvern, Pa.

Patinum Scrap, Buyers of
Bishop, J., & Co., Malvern, Pa.
Roessler & Hasslacher Co., New York.

Platinum Sheets, Wire, Foil, Etc.
Bishop, J., & Co., Malvern, Pa.

Plumbago (See Graphite).

Polishing, Buffing and Burnishing Machinery and Appliances (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Automatic Buffing Machine Co., Buffalo, N. Y.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Cleveland Blow Pipe Co., Cleveland, O.
Cleveland Platers' Supply Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., Jackson, Mich.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Middleditch, Benj., Detroit, Mich.
Moyer, D. B., Walled Lake, Mich.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Osborn Mfg. Co., Cleveland, O.
Peckham Mfg. Co., Newark, N. J.
Pfleghar Hardware Sp'lty Co., New Haven, Conn.
Roth Bros., Chicago, Ill.
Tolhurst Machine Works, Troy, N. Y.

Polishing Belts, Endless (See also Platers' Supplies).
Ames Sword Co., Chicopee, Mass.

Polishing Meal for Dry Tumbling
Peckham Mfg. Co., Newark, N. J.

Potash. (See also Platers' Supplies).
International Chemical Co., Camden, N. J.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.

Presses, Bench and Foot
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Company, Brooklyn, N. Y.
Shuster, The F. B., Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Cabbaging
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Presses, Coining
Bliss, E. W., Co., Brooklyn, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Drop
Bliss, E. W., & Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Power
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Foundry Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Pressure Blowers. (See also Foundry Supplies).
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Pyrometers.
Bristol & Co., The, Waterbury, Conn.

Riveting Machines.
Shuster, The F. B., Co., New Haven, Conn.
Wood, R. D., & Co., Philadelphia, Pa.

Rivets—Brass, Aluminum, Etc.
Hassall, John, Inc., New York.
Hendricks Bros., New York.
Kemp, W. H., Co., New York.

Roll-Grinding Machines.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Chilled and Sand
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Jewelers'
Oliver, W. W., Mfg. Co., The, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolling Mill Machinery.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Oliver, W. W., Mfg. Co., The, Buffalo, N. Y.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rouge. (See Platers' Supplies).

Sand, Fire (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Machinery and Equipment.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Systems
Pangborn, Thomas W., Company, New York.

Sand Blast Tumbling Barrels.
Pangborn, Thomas W., Company, New York.

Sand Dryers
Pangborn, Thomas W., Company, New York.

Sand Handling and Conveying Machines
Pangborn, Thomas W., Company, New York.

Sand Dryers, Sifters and Mixers.
(See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

Sand, Molding (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Pangborn, Thomas W., Company, New York.
Paxson, J. W., Co., Philadelphia, Pa.

Sawdust, Boxwood, for Drying Purposes.
(See also Platers' Supplies).
Sommers, John, Faucet Co., Newark, N. J.

Sawdust Drying-out Boxes.
(See also Platers' Supplies).
Bennett-O'Connell Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Steiner, E. E., Newark, N. J.

Shears, Power
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) aFrrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Sheet Metal Straightening, Cutting and Forming Machinery.
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Shuster, The F. B., Co., New Haven, Conn.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Sheradizing (See also Galvanizing).
Globe Machine & Stamping Co., Cleveland, O.

Sheradizing Ovens
Gehnrich, Hermann, New York.
Globe Machine & Stamping Co., Cleveland, O.
Rockwell Furnace Co., New York.

Silicon.
American Smelting & Refining Co., Cincinnati, O.
Leavitt, C. W., & Co., New York.

Silicon Copper.
American Smelting & Refining Co., Cincinnati, O.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Roessler & Hasslacher Chemical Co., New York.

Silver, Nitrate and Chloride of
(See also Platers' Supplies).
Jackson, John J., Co., Newark, N. J.

Silver Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.

Silver, Rolled Sterling
Jackson, John J., Co., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Silver Wire.
Jackson, John J., Co., Newark, N. J.

Smelters, Sweep
Renziehausen, Wm. F., Co., Newark, N. J.

Soap. (See also Platers' Supplies).
International Chemical Co., Camden, N. J.

Solder, Aluminum
Aluminum Company of America, Pittsburg, Pa.
American Solder Co., Boston, Mass.
Clum & Atkinson, Rochester, N. Y.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Janney, Steinmetz & Co., Philadelphia, Pa.
Kemp, W. H., Co., New York.
Richards & Co., Boston, Mass.
U. S. Reduction Co., Chicago, Ill.

Solder, Brazing
American Smelting & Refining Co., Cincinnati, O.
Hussey, C. G., & Co., Pittsburg, Pa.
Linton & Co., Providence, R. I.
Merchant & Evans Co., Philadelphia, Pa.
National Metal Reduction Co., Cleveland, O.
Naulty Smelting & Ref'g Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Shimer, H. M., & Co., Philadelphia, Pa.

Solder, Gold
Linton & Co., Providence, R. I.

Solder, Silver
Jackson, John J., & Co., Newark, N. J.
Linton & Co., Providence, R. I.

Solder, Tinners'
American Smelting & Refining Co., Cincinnati
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Spelter.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Grasselli Chemical Co., Cleveland, O.
Hegeler Bros., Danville, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Illinois Zinc Co., Peru, Ill.
Leavitt, C. W., & Co., New York.
Matthiessen & Hegeler Zinc Co., La Salle, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
National Metal Reduction Co., Cleveland, O.
New Jersey Zinc Co., The, New York.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., Chicago, Ill.
U. S. Reduction Co., Chicago, Ill.
Vogelstein, L., & Co., New York.

Spinning Lathes.
Bliss, E. W., Company, Brooklyn, N. Y.
Prybil, P., New York.

Spraying Machines.
Eclipse Air Brush & Compressor Co., Bloomfield, N.J.
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Paasche Air Brush Co., Chicago, Ill.
Pangborn, Thomas W., Company, New York.

Sprue Cutters. (See also Foundry Supplies).
Bliss, E. W., Company, Brooklyn, N. Y.
Middleditch, Benj., Detroit, Mich.
Nicholls, Wm. H., New York.
Shuster, The F. B., Co., New Haven, Conn.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Turner Machine Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Tacks. (See name of metal wanted).

Tanks, Electroplaters' (See also Platers' Supplies).
Chadwick-Boston Lead Co., Boston, Mass.
Corcoran, A. J., Inc., New York.
Hanson & Van Winkle Co., Newark, N. J.
Stearns, The A. T., Lumber Co., Boston, Mass.

Tin, Chloride of
Grasselli Chemical Co., Cleveland, O.

Tinning Machines
Globe Machine & Stamping Co., Cleveland, O.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.